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SPAWNING DISTRIBUTION OF FALL CHINOOK SALMON IN THE SNAKE RIVER

Annual Report 2000

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SPAWNING DISTRIBUTION OF FALL CHINOOK SALMON IN THE SNAKE RIVER

ANNUAL REPORT 2000

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CHAPTER ONE

Spawning Distribution of Supplemented Fall Chinook Salmon in the Snake River Basin Upriver of Lower Granite Dam

2000 Progress Report

by

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Abstract

From 1997 to 2000, we collected data on the spawning distribution of fall chinook salmon above Lower Granite Dam as part of a five-year evaluation of three acclimation/release facilities: Pittsburg Landing, Captain John, and Big Canyon Creek. The use of multiple facilities is intended to distribute spawning throughout the habitat normally used in the Snake and Clearwater rivers, and our study was designed to determine if this is achieved. In the Snake River, spawning normally occurs throughout a 100 mile reach. Pittsburg Landing is located within the upper half of this reach, and Captain John is located within the lower half. In the Clearwater River, most spawning occurs within the lower 41 miles and the Big Canyon Creek facility is located therein. Our approach for determining spawning distribution was to first trap returning fish at Lower Granite Dam, identify their origin (all yearling fish were externally marked before they were released), and use radio tags and redd searches to determine where they spawned. Thus far we radio tagged 203 adult fish that were initially released at the acclimation sites. We confirmed the spawning location of 74 of these fish, 42 from releases at Pittsburg Landing, seven from Captain John, and 25 from releases at the Big Canyon Creek facility. All of the fish from Pittsburg Landing spawned in the Snake River, 86% within the upper half of the Snake River study area, and 14% in the lower half. Of the adult fish from Captain John, roughly 71% spawned in the lower half of the Snake River study area, 14% spawned in the upper half, and 14% spawned in the Clearwater River. Of the adult fish from releases at Big Canyon Creek, 80% spawned in the Clearwater River and 20% spawned in the Snake River (four in the lower half and one in the upper half). To augment the study, we determined the spawning locations of 16 adult fish that were directly released as subyearlings at or near the three acclimation sites. Ten of the fish were from Pittsburg Landing, three from Big Canyon Creek, and three from the Captain John area. All of the fish from Pittsburg Landing spawned in the Snake River (nine in the upper half, and one in the lower half). All of the fish from Big Canyon Creek spawned in the Clearwater River, and all of the fish from Captain John area spawned in the lower half of the Snake River study area. We also tagged and tracked six adult natural fish. These fish were initially captured and PIT-tagged in the Snake River when they were juveniles, and, based on our observations, all spawned in the Snake River and did not wander into other rivers after crossing Lower Granite Dam. Our results indicate that the supplementation program will accomplish its objective in terms of spawning distribution, although currently the sample size for some groups is too small for the results to be conclusive. To finish the study we plan to tag 340 fish in the fall-winter of 2001-2002, and complete the final report by November 2002.

Introduction

In 1996, a program was started to increase the natural production of fall chinook salmon (*Oncorhynchus tshawytscha*) upriver of Lower Granite Dam. The program involved releasing yearling fall chinook salmon from Lyons Ferry Hatchery at three acclimation facilities: Pittsburg Landing, Captain John, and Big Canyon (Figure 1). The Pittsburg Landing facility was first used in the spring of 1996, followed by Big Canyon in 1997, and Captain John in 1998. Fish were released annually from each site after its completion.

Fishery managers chose to use multiple acclimation/release facilities with the intent of distributing spawning throughout the habitat normally used by fall chinook salmon. In the Snake River, spawning occurs throughout a 100 river-mile (RM) reach between Asotin, Washington (RM 147), and Hells Canyon Dam (RM 247). The Captain John facility is located in the lower half of this reach, and Pittsburg Landing is in the upper half. In the Clearwater River, most spawning occurs between the river mouth (RM 0) and the North Fork Clearwater River (RM 41), and the Big Canyon Creek facility is located therein.

The fall chinook salmon supplementation program was designed to include a thorough evaluation (WDFW et al. 1996). Our part in this evaluation was to determine where the supplemented fish spawned, if the intended spawning distribution was achieved, and expand the information available on the spawning distribution of hatchery fish released as subyearlings, and natural fish.

Our work began in 1997 and is scheduled for completion in 2002 (Garcia et al. 1999, 2000). In this report we present summary information and preliminary findings based on the data collected thus far.

Description of Project Area

The study area included the Snake River from Ice Harbor Dam to Hells Canyon Dam, portions of the Grande Ronde, Imnaha, and Salmon rivers, all of the Clearwater River, and some tributaries of the Salmon and Clearwater rivers (Figure 1). River locations were based on river miles. Our work was routinely conducted along 178 miles of the Snake River from Little Goose to Hells Canyon dams, 41 miles of the Clearwater River from the mouth to Dworshak Fish Hatchery, 53 miles of the Grande Ronde River from the mouth to Wildcat Creek, and 4 miles of the Imnaha River from the mouth to Cow Creek Bridge. Radio-tracking was also conducted in other parts of the study area, though less frequently.

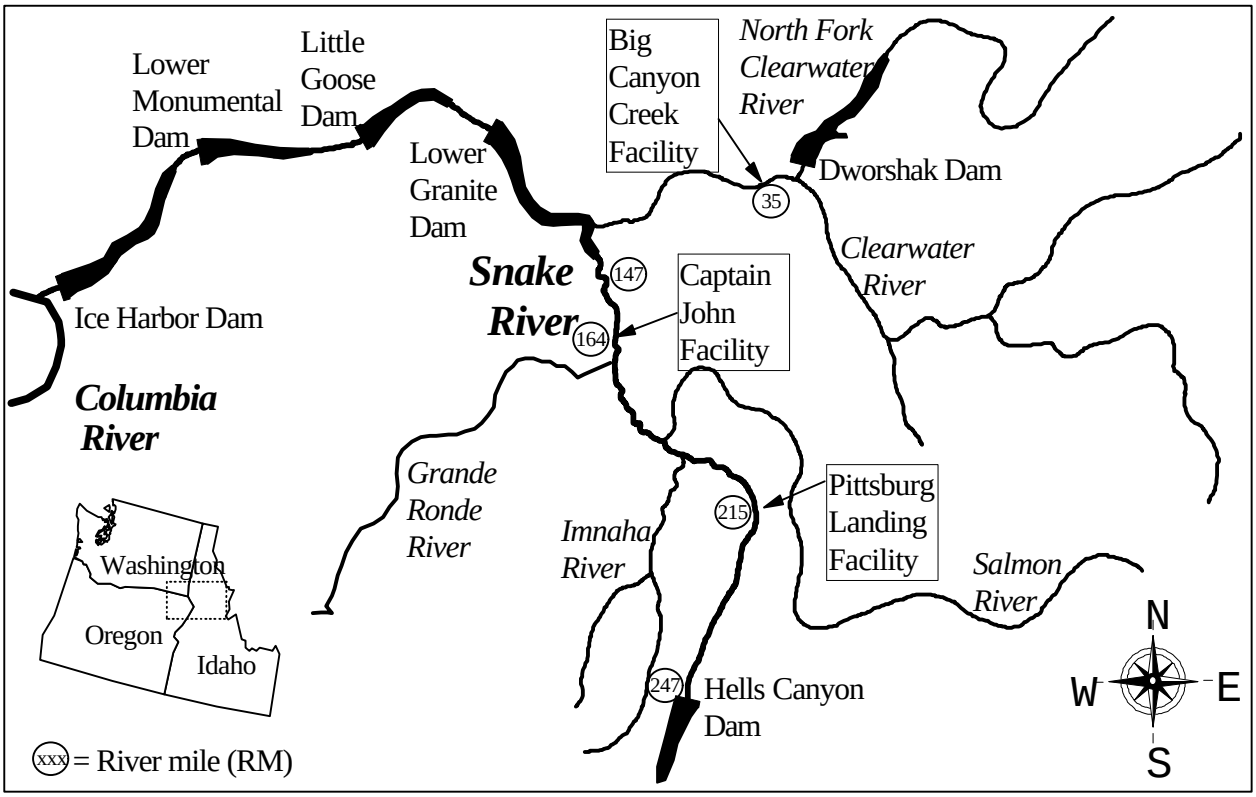

Figure 1. Map of the study area showing the major rivers in the lower Snake River, and the three fall chinook salmon acclimation facilities and corresponding river miles.

Methods and Materials

There were four main components in our study design: (1) radio-tag target fish at the Lower Granite Dam adult fish trap; (2) track the tagged fish throughout the Snake River and tributaries; (3) determine where the tagged fish spawned using redd searches (redd-search methods are covered in Chapter 2); and (4) document and compare the spawning distributions of fish from the different target groups.

Radio Tagging

All yearling fall chinook salmon released upriver of Lower Granite Dam were coded-wire tagged, fin clipped, and injected with a colored elastomer tag that, in combination with placement (right or left eye), could be used to determine where each fish was released. The origin of hatchery fish released as subyearlings was determined using PIT-tags that were implanted prior to release. PIT-tags were also used to identify known natural fish. These fish were initially captured in the Snake and Clearwater rivers when they were juveniles and PIT-tagged for research purposes.

We tagged mostly female fish since they construct redds (Scott and Crossman 1973, Schroder 1981) and thus provided us a better opportunity to determine spawning location. Male fish (adults and jacks) from each release group were also tagged to obtain information on the

movements of all age groups and both sexes.

Fish were captured at the Lower Granite Dam fish trap and anesthetized before tagging. Radio tags were coated with glycerine and inserted into the esophagus of study fish. Two sizes of radio tags were used depending on the length of the fish; 16-g tags (Lotek MCFT-3) were used for fish less than 60 cm (jacks), and 29-g tags (Lotek MCFT-7A) for fish 60 cm and larger. All radio tags were obtained free-of-charge from the University of Idaho. Most of these tags were previously used which decreased the available battery life.

Tracking

Tracking was conducted by the U.S. Fish and Wildlife Service (USFWS), Nez Perce Tribe (NPT), University of Idaho, and Washington Department of Fish and Wildlife (WDFW). Fish were tracked using fixed receivers and mobile tracking methods.

Fixed-telemetry receivers were maintained and operated by the USFWS and the University of Idaho. In the Snake River, fixed receivers were positioned at, and downriver of, Lower Granite Dam, and near Heller Bar (RM 168), Dug Bar (RM 197), Pittsburg Landing (RM 216), and near Hells Canyon Dam (RM 247)(Figure 2). In the Clearwater River, fixed telemetry stations were located near the Potlatch Mill (RM 5) and above Orofino at the Nez Perce Tribe Fisheries Office (RM 47). Telemetry stations were also positioned within the lower mile of the Grande Ronde and Salmon rivers. Tracking data were downloaded from these receivers periodically. Receivers indicated when an individual radio tag (fish) arrived and departed, and in some cases, which direction (upriver or downriver) the fish was traveling.

Mobile tracking was conducted by the USFWS, NPT, and WDFW. Portions of the Snake River reservoirs were surveyed weekly using fixed-wing aircraft. The roaded sections of the Snake, Clearwater, and lower Grande Ronde rivers were surveyed weekly via automobile. Portions of the un-roaded section of the Snake River were surveyed weekly by boat (in the course of downloading fixed receivers) and helicopter (while conducting redd searches).

Redd searches

Redd searches (aerial and underwater) were used to determine when and where radio-tagged fish spawned and for ongoing population monitoring. For more information on redd searches, refer to Chapter 2 of this report. Fish were determined to have spawned at a location if their arrival at the location corresponded with the observation of a new redd during the same week (see example in Figure 3), or, in the case of sites searched using underwater cameras, if the fish remained for more than a week and redds were present when searched.

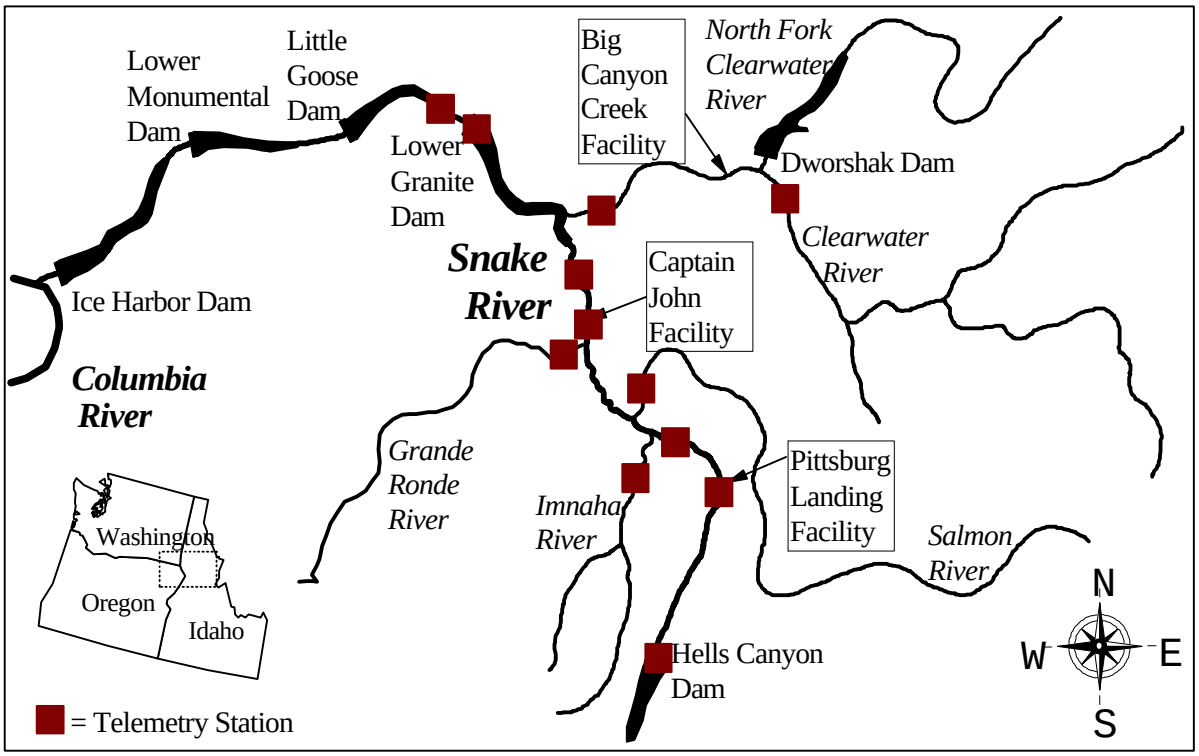

Figure 2. Map of the study area showing locations of fixed telemetry stations used for tracking fall chinook salmon.

Results

In 2000, we radio-tagged 134 adult fall chinook salmon, all of hatchery origin (Table 1). The first fish was tagged on September 9 and the last on November 6 (Appendix 1). This brought the total to 293 fall chinook salmon radio tagged for this study, including 203 adult fish and 45 jacks that were initially released as yearlings. The remainder included 35 adult fish from subyearling releases at or near the acclimation sites (17 from the Pittsburg Landing site, 12 from the Captain John area, and six from Big Canyon Creek), and ten natural fish (eight from the Snake River, one from the Grande Ronde River, and one from the Clearwater River).

Of the 293 fish that were radio tagged, 228 (78%) entered free-flowing water (Appendix 2), and of those, 96 (42%) were confirmed to have spawned. The remainder (which included jacks) might have spawned even though we did not confirm their spawning location(s). Of the 65 fish that did not enter free-flowing water, 16% spit the radio tag after release or had the tag removed, and the rest were never tracked beyond the fish ladder at Lower Granite Dam or beyond Lower Granite Reservoir. We saw no direct evidence of pre-spawning mortality, and fallback at Lower Granite Dam was uncommon (6% of the fish fell back and did not re-ascend the fish ladder), which leads us to believe that many of the tags that we could not track through the spawning season lost battery power before the fish spawned.

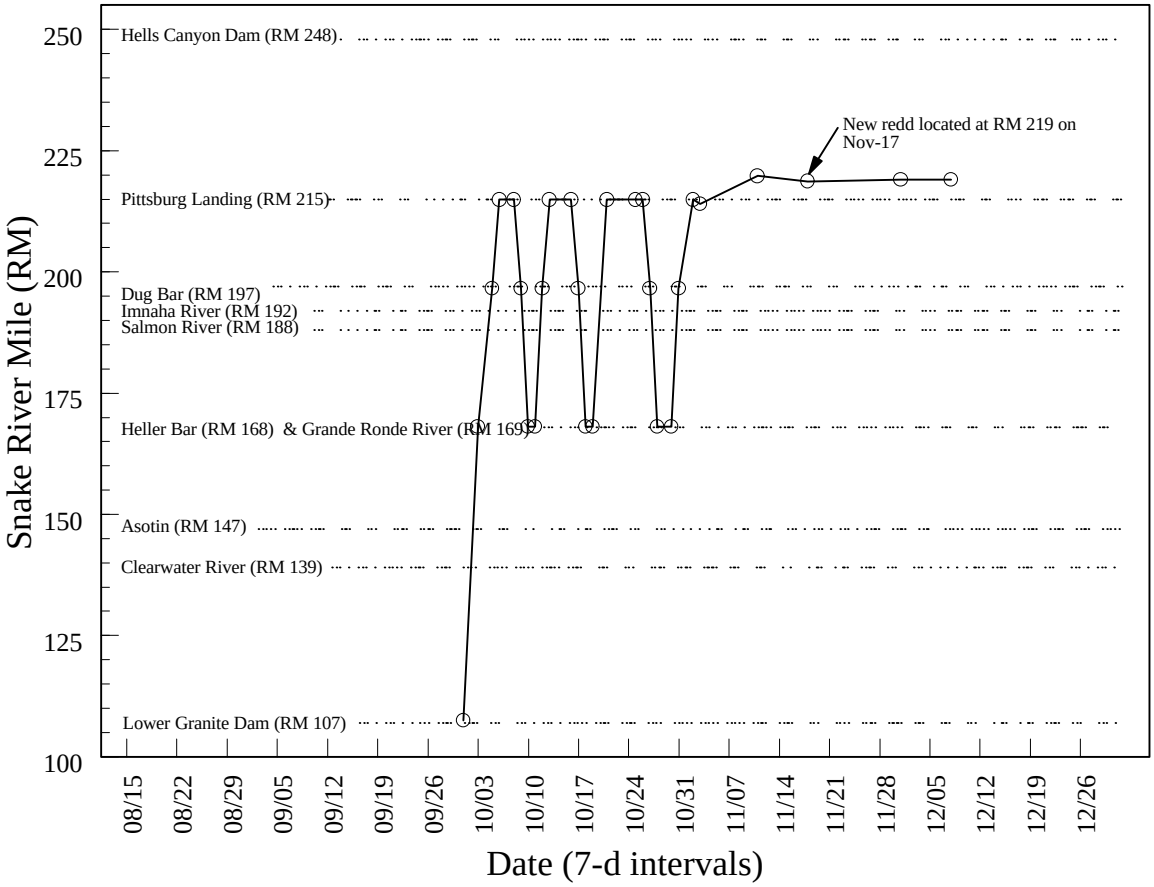

Figure 3. Detections of radio tag 10-46, inserted into a 72-cm female fall chinook salmon that was released as a yearling in 1996 at Pittsburg Landing. This fish was trapped on September 30, 1998. Circles represent locations where the tag was detected either by fixed telemetry stations (Lower Granite Dam, Heller Bar, Dug Bar, and Pittsburg Landing) or mobile tracking.

Table 1. Tagging schedule by year and target group for Snake River fall chinook salmon.

Year	Pittsburg Landing (PLD)	Big Canyon Creek (BCC)	Captain John (CJ)	Subyearling and/or natural fish	Totals	Comments
1997	16			6	22	PLD fish were one-ocean males
1998	30	15		19	64	BCC fish were one-ocean males
1999	20	28	14	11	73	CJ fish were one-ocean males
2000	43	48	34	9	134	Completed

Adults initially acclimated and released as yearlings (spawning location known)

Pittsburg Landing (Upper Snake). — We identified the spawning location of 42 adult fish that were initially released as yearlings from the Pittsburg Landing acclimation facility. Of these fish, 83% entered only the Snake River prior to spawning, and the rest (17%) wandered into the Salmon River once or twice for up to three days at a time. All of the fish spawned in the Snake River, six in the lower half and 36 in the upper half (Figure 4). When the spawning distribution of radio-tagged fish is viewed in comparison to redd distribution before and after supplementation (Figure 5), it is clear that the fish from Pittsburg Landing distributed on the spawning grounds similar to that of hatchery-origin adults that were not radio tagged, and that they spawned in areas normally used by fall chinook salmon.

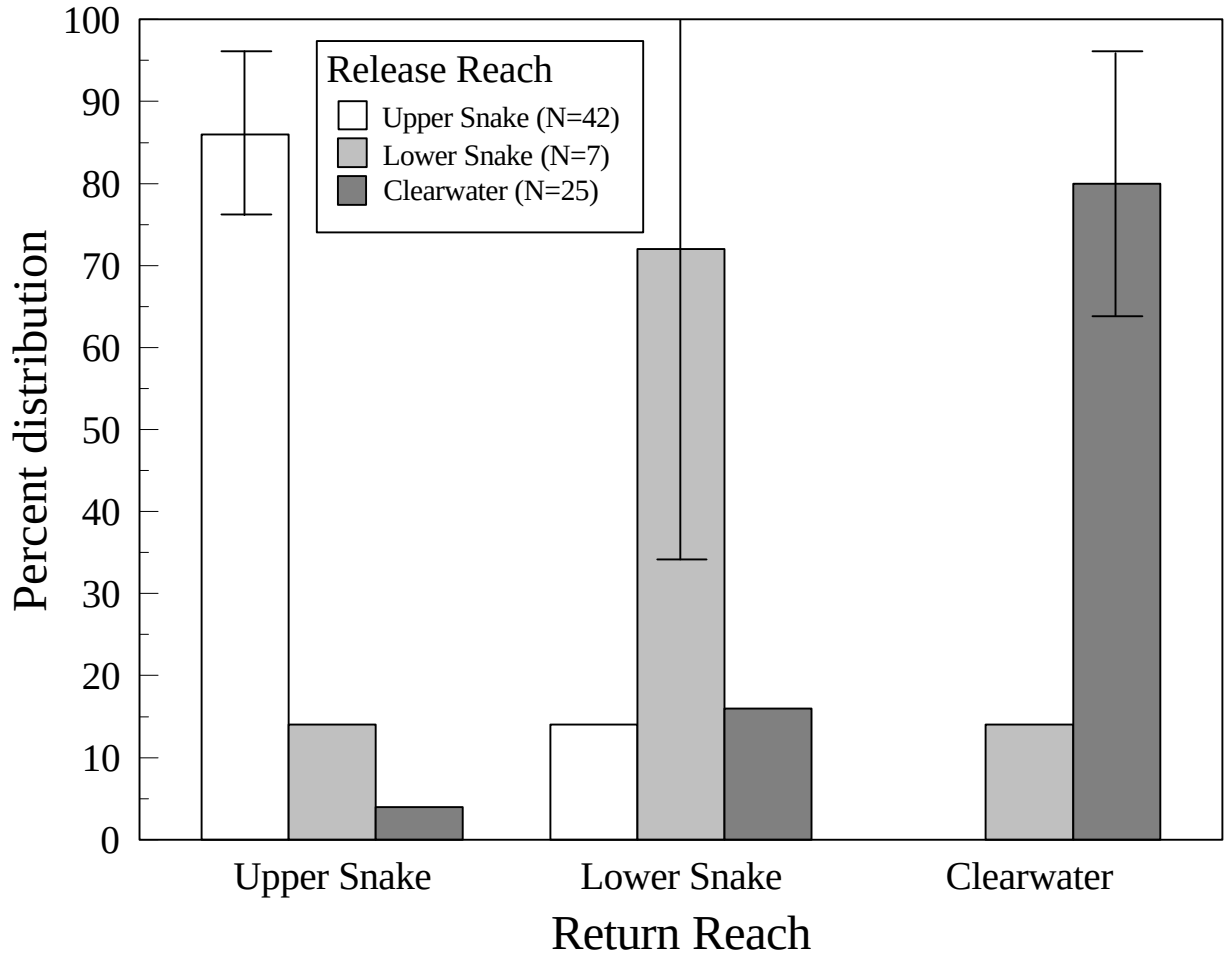

Figure 4. Percent distribution of adult fall chinook salmon (initially released as yearlings) by observed spawning location in the upper Snake River, Lower Snake River, and Clearwater River, in relation to release reaches. The vertical lines are 95% error bounds (Schaefer et al. 1996).

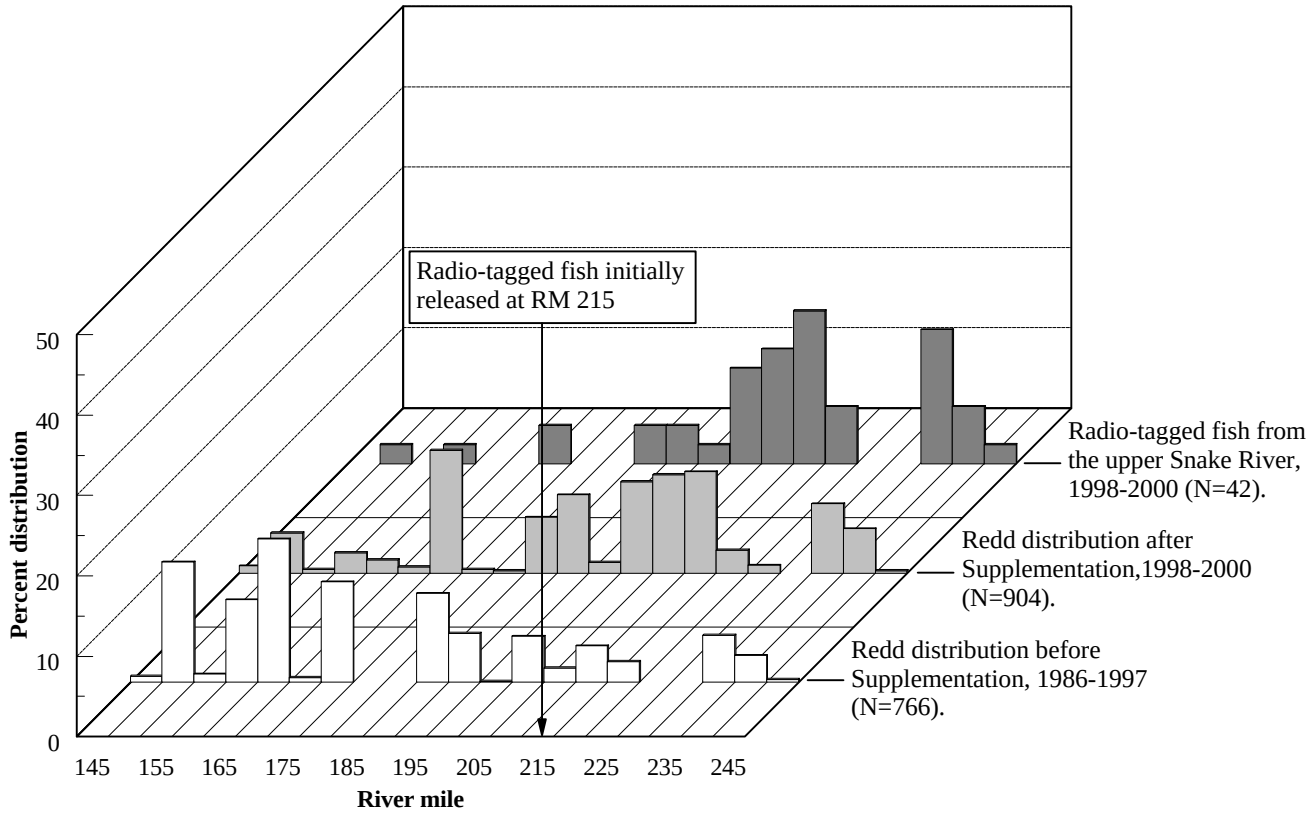

Figure 5. Numbers of observed redds for radio-tagged fish initially released in the upper Snake River (RM 215) as yearlings by river mile, and the cumulative redd distribution before and after the return of adult fish from supplemental releases of yearlings in the upper Snake River.

Captain John (Lower Snake). — We identified seven fish in this category, 43% of which entered only the Snake River prior to spawning, and 43% wandered into the Clearwater River, 29% into the Grande Ronde River, and 14% into both the Clearwater and Grande Ronde rivers. Of the seven fish, six spawned in the Snake River (five in the lower half, and one in the upper half). The remaining fish spawned in the Clearwater River. This fish entered the free-flowing portion of the Snake River first and remained there for nine days before entering the Clearwater River and spawning.

Big Canyon Creek (Clearwater). — We identified the spawning location of 25 adult fish that were initially released as yearlings from the Big Canyon Creek acclimation facility, 40% of which entered only the Clearwater River. The rest wandered into the Snake River, with one fish also entering the Grande Ronde River. Of the 25 fish, 20 spawned in the mainstem Clearwater River downstream of the North Fork Clearwater River. The remaining five fish spawned in the Snake River (four in the lower half, and one in the upper half). One of the fish that spawned in the Snake River did not enter the Clearwater River at any time.

Estimates of spawning distributions. — We estimated the 95% error bound (Schaeffer et al. 1996) for the proportion of returning adults that spawned in the intended river reaches (Figure 4). The error was ±10% for fish that were released in, and spawned in, the upper Snake River, ±37% for fish that were released in, and spawned in, the lower Snake River, and±16% for the fish that were released in, and that spawned in, the Clearwater River.

Jacks initially acclimated and released as yearlings (spawning location unknown)

Because jacks did not construct redds, we could not confirm their spawning locations. However, we followed the movements of jacks to determine the extent of their wanderings.

Pittsburg Landing. — Of the 16 jacks from Pittsburg Landing that were radio tagged, 11 (69%) entered free-flowing water. Of these, ten (91%) entered only the Snake River.

Captain John. — All of the 14 jacks from Captain John entered free-flowing water, three (21%) entered only the Snake River.

Big Canyon Creek. — Of the 15 jacks from Big Canyon Creek, 10 (67%) entered free-flowing water. Of these, 7 (70%) entered only the Clearwater River.

Other observations. — The movements of jacks were similar to that of adults that were confirmed to have spawned. On average jacks and adults made two river entries (counting multiple entries into the same river). The maximum number of river entries made by any one fish was 11 for jacks and 12 for adults. On average jacks and adults entered one river. The maximum number of different rivers entered by any one fish was four for jacks and three for adults.

Adult fish that were released as subyearlings (spawning location known)

Pittsburg Landing. — We identified the spawning location of ten fish that were initially released without being acclimated as subyearlings from Pittsburg Landing. Nine of these fish entered only the Snake River, and one fish wandered into the Salmon River for about 12 hours. All of the fish spawned in the Snake River (one in the lower half, and nine in the upper half).

Captain John area. — We identified the spawning location of three fish in this category, all of which spawned in the lower half of the Snake River. None of these fish wandered.

Big Canyon Creek. — We were able to confirm the spawning location of three fish in this category, two of which entered only the Clearwater River, and one that wandered into the Snake River prior to spawning. All of the fish spawned in the Clearwater River.

Estimates of spawning distributions. — We estimated that 90±16% of the hatchery subyearlings released directly into the Snake River at Pittsburg Landing return to spawn in the upper Snake River. The fish from Captain John and Big Canyon Creek spawned where intended though the sample sizes were low.

Natural fish initially captured and PIT-tagged as juveniles

We identified the spawning location of six fish that were initially captured and PIT-tagged as subyearlings (one in the Clearwater River and five in the Snake River). All of the fish only entered the river where they were initially captured.

Summary and Discussion

Thus far the data indicate that releasing juvenile fall chinook salmon at the three acclimation facilities distributes spawners throughout the Snake River study area and in the lower Clearwater River as intended.

The performance of yearlings released at the Captain John facility (lower Snake River) appeared to differ from that of yearlings released at the other two facilities. However, the widths of the 95% error bounds were wider than desirable for a conclusive assessment. We propose to achieve a $\pm$10% error bound for all groups. To meet this target we will attempt to radio-tag 193 fish from Captain John, and 110 from Big Canyon in FY2002-2003.

We also propose to achieve a $\pm$10% error bound for un-acclimated subyearlings released at Pittsburg Landing. To meet this target we will attempt to radio-tag 37 adult returns from Pittsburg Landing in FY2002-2003.

Fall chinook salmon released at Pittsburg Landing showed a greater tendency to spawn in the release river than fish that were released at the Captain John and Big Canyon Creek sites. This suggests that the closer a release site is to an adjacent river that has spawning habitat, the more likely fish released at the site will stray into and spawn in that adjacent river.

Wandering appears to be a common behavior among all release groups, although, like straying, it is more common the closer a release site is to another river. There is little indication that large numbers of the radio-tagged fish held in areas for prolonged periods for thermal refuge, or that they spawned in areas far from their origin because of more favorable spawning habitat quality, water temperature, or other environmental conditions.

We included jacks in the sample thinking it would be reasonable to assume they spawned during their travels and that we could use their movements as a high-end indicator of straying. We found, however, that the assumption was not valid since the movements of jacks were similar to that of the adults.

Comparisons of redd counts versus estimates of available spawning habitat in the Snake and Clearwater rivers indicate spawning habitat is widely distributed and grossly under seeded (Connor et al., in review; Arnsberg et al. 1992). Thus the spawning distribution we observed was likely patterned by preference more so than habitat distribution.

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CHAPTER TWO

Fall Chinook Salmon Spawning Ground Surveys in The Snake River Basin Upriver of Lower Granite Dam, 2000

by

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Abstract

In 2000, aerial searches for fall chinook salmon redds were conducted upriver of Lower Granite Dam in portions of the Snake, Grande Ronde, Imnaha, and Salmon rivers, all of the Clearwater River, and some tributaries of the Clearwater River. In addition, underwater searches were conducted in the Snake River using submersible cameras. A total of 536 redds were counted, and of these, 346 were observed in the Snake River (255 during aerial searches, and 91 using submersible cameras), 172 in the Clearwater River, one in the South Fork Clearwater River, eight in the Grande Ronde River, and nine in the Imnaha River. The redd counts for 1999 and 2000 were higher than previous years (579 were counted in 1999, 303 in 1998, and 189 in 1997), and corresponded with an increase in the number of adult fall chinook salmon counted at Lower Granite Dam (2,323 in 2000, 1,862 in 1999, 962 in 1998, and 1,007 in 1997).

Introduction

Redd searches were conducted between Lower Granite Dam and Hells Canyon Dam in 2000 as part of an ongoing effort to annually monitor fall chinook salmon spawning in the Snake River and tributaries. The first reports of redds observed in this area were from aerial searches of the Snake River conducted intermittently between 1959 and 1978 (Irving and Bjornn 1981, Witty 1988; Groves and Chandler 1996)(Appendix 3). In 1986, the Washington Department of Fish and Wildlife (WDFW) began an annual redd-search program that included aerial searches of the Grande Ronde River the first year (Seidel and Bugert 1987), and the Imnaha River in subsequent years (Seidel et al. 1988; Bugert et al. 1989-1991; Mendel et al. 1992). The U. S. Fish and Wildlife Service (USFWS) and Idaho Power Company (IPC) began contributing to this monitoring effort in 1991 by increasing the number of aerial searches conducted each year, and by adding underwater searches in areas of the Snake River that were too deep to be searched from the air (Connor et al. 1993; Garcia et al. 1994a, 1994b, 1996, 1997, 1999, 2000; Groves 1993; Groves and Chandler 1996). The Nez Perce Tribe (NPT) also contributed to the effort by adding aerial searches within the Clearwater River basin beginning in 1988 (Arnsberg et. al 1992), and the Salmon River basin beginning in 1992.

The objective of this report is to consolidate the findings from annual redd searches into a single document containing detailed information from the most recent spawning season, and summary information from that of previous years. The work conducted in 2000 was funded by the Bonneville Power Administration (Projects: 9403400, 9801003), Idaho Power Company, U.S. Bureau of Land Management – Cottonwood Resource Area, and U.S. Forest Service – Wallowa Whitman National Forest.

Description of Project Area

The study area included the free-flowing Snake River between Lower Granite and Hells Canyon dams, and portions of the major tributaries that enter therein (Figure 1). We refer to redd locations using river miles (RM), and nearby landmarks. In 2000, the following eight river sections were regularly searched: (1) the Snake River from the head of Lower Granite Reservoir (RM 147) to Hells Canyon Dam (RM 247); (2) the Clearwater River, to its confluence with the

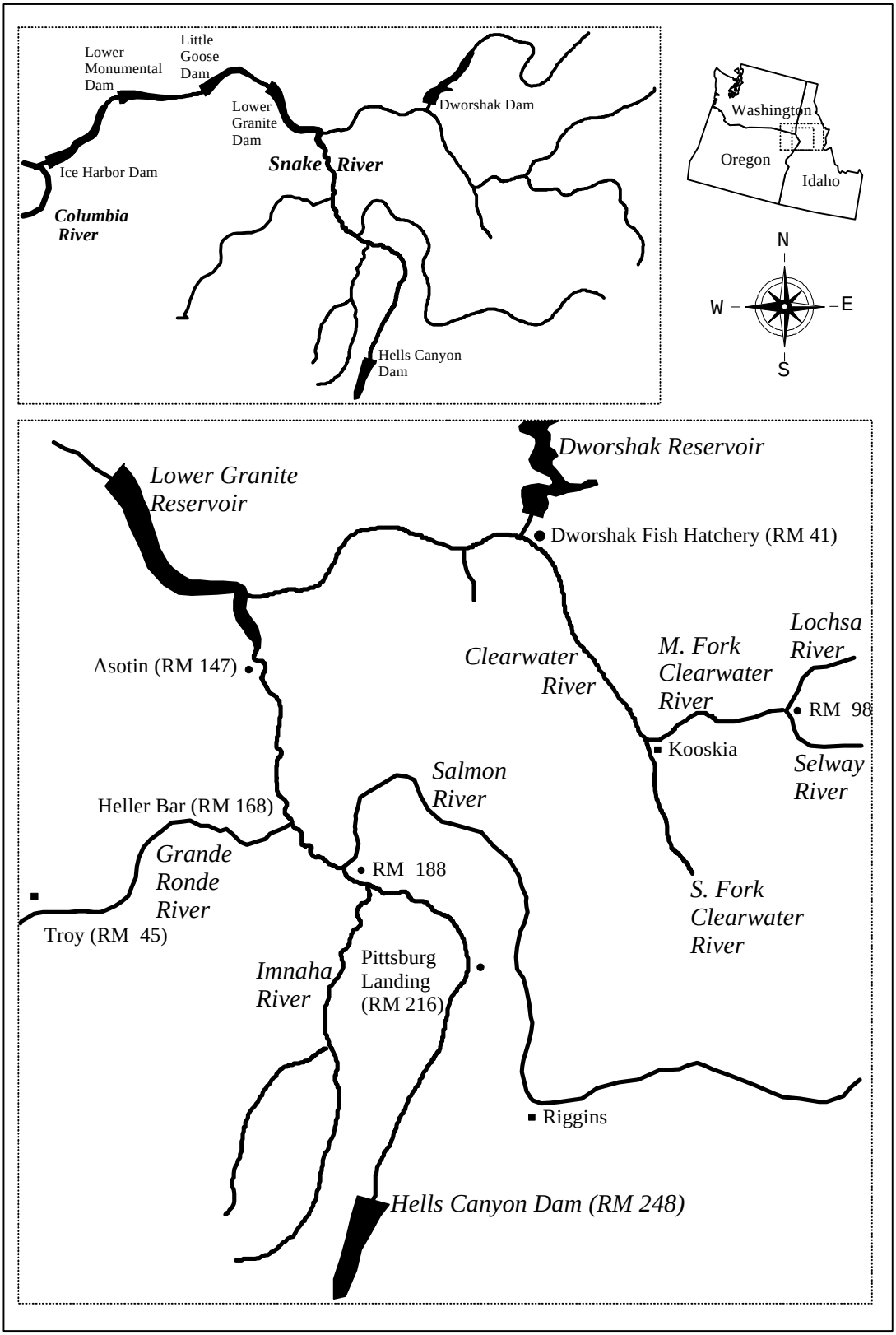

Figure 1. Map of the Snake River drainage in Oregon, Washington, and parts of Idaho.

Selway River (RM 98); (3) the Selway River to Meadow Creek (RM 19); (4) the North Fork Clearwater River to Dworshak Dam (RM 2); (5) the South Fork Clearwater River to Butcher Creek (RM 12); (6) the Grande Ronde River to Wildcat Creek (RM 53); (7) the Imnaha River to near Freezeout Saddle (RM 35); and (8) the Salmon River to about French Creek (RM 105).

Methods and Materials

Redd searches were conducted from a helicopter flown at an altitude of about 700-ft. or less. Observations were made by the pilot and one or two observers. Only the number of new redds observed on each search were included in this report. From 1991 to 2000, searches in the Snake, Clearwater, Grande Ronde, and Imnaha rivers were scheduled to be conducted at approximately 7-d intervals starting around mid-October and ending around mid-December. In previous years, and in the other rivers, searches were typically conducted less frequently. In most years, some of the scheduled searches were canceled or shortened due to poor visibility or inclement weather. Redds observed in the Snake River that could not clearly be distinguished from the air were examined from the ground beginning in 1991. This practice was also performed in the other rivers, though less consistently.

In addition to the helicopter searches, redd searches in the Snake River were conducted using underwater search methods to locate redds in areas too deep to be effectively searched from the air. In 1991 and 1992 the USFWS conducted underwater searches using methods developed by Swan (1989) that involved direct observation of the river bottom by scuba divers (Connor et al. 1993; Garcia et al. 1994a). From 1993-2000, the USFWS and IPC conducted underwater searches using a video system consisting of a DC-powered video recorder, submersible camera with a 110° lens and 65-ft camera cable, and at least one monitor. The submersible camera was either enclosed in an aluminum sheath mounted on a 90-lb lead weight, or attached to an aluminum frame mounted between two 30-lb lead weights, and could be adjusted 45° to 90° down from horizontal (Groves and Garcia, 1998). The camera was suspended from a boat using a wire rope passed through a roller on the bow and attached to a sounding-reel/depth-indicator mounted in the boat cabin.

Searches using submersible cameras were conducted by passing the camera over the river bottom in a zigzag pattern, or by moving upriver along parallel paths. In each case, the distance between passes was about 30 ft. From 1993 to 1998, only the zig-zag search pattern was used, and the distance between passes was judged either by estimating distance using natural land features, or by placing a rope constructed of different colored 30-ft sections along the shoreline. In 1999 and 2000, both the parallel-path and zig-zag search patterns were used. Parallel paths were maintained using a GPS receiver and a computer display that showed real-time position relative to prescribed paths drawn in over a map of each study site. During all searches, the distance between the camera and river bottom, and the angle of the camera, was adjusted to maximize the amount of viewable area without losing our ability to observe details of the bottom substrates. If a redd was observed, the distance between passes in the search pattern was reduced by about half, and in most cases, the entire area was searched at least one more time.

Underwater observations of redds were recorded on video tape beginning in 1993. When large groups of redds were found, corresponding survey coordinates were also recorded using electronic surveying equipment positioned on shore, or a GPS receiver positioned on the boat. These coordinates were used to plot the position of redds observed on each search so they could be referenced along with the video tape to determine the total number of redds at each spawning location. In areas where redds overlapped and could not be identified individually, the perimeter of the redd group was surveyed and the overall area divided by the average size of fall chinook salmon redds observed in the Columbia River (183 ft^2)(Chapman et al. 1986). This produced an index count of the total number of redds in the group.

Underwater searches were limited to areas greater than about 10-ft deep with a dominant bottom substrate particle size (Bovee 1982) ranging from 1- to 6-in. diameter (Raleigh et al. 1986). In 1991 and 1992, a few pilot searches were conducted at known spawning sites. Then from 1993 to 2000, we attempted to annually search about 90 deep-water areas that fit the substrate size and the depth criteria (based on Hells Canyon Dam discharged of about 9,000 cfs). Some of the spawning sites that were typically only searched from the air were also searched using submersible video cameras during spawning seasons when Hells Canyon Dam discharge was higher than 9,000 cfs.

Results and Discussion

Snake River.— A total of 346 redds were observed in the Snake River in 2000 (Table 1). Of the 346 redds, 255 were observed during nine aerial searches (Table 2), and 91 were observed using submersible cameras at eight of 60 deep-water sites searched (Tables 3 and 4). The locations of all redds counted in the Snake River since 1986 are given in Appendix 4. Redds were observed from the air in seven areas not known to be used by spawning salmon prior to 2000. Overall, the redds counted in the Snake River amounted to 65% of all redds observed upriver of Lower Granite Dam in 2000, compared to 64% in 1999, 61% in 1998, 31% in 1997, and 55% in 1996.

The number of searches conducted in the Snake River was comparable to that of recent years (Table 5). Overall, aerial search conditions were reported as “fair” to “good”(Table 6). During all of the searches (both aerial and underwater), river discharge ranged from about 9,470 cfs to 10,100 cfs at Hells Canyon Dam (RM 247), and 14,400 cfs to 16,500 cfs at the Anatone Gauge (RM 167) near the Grande Ronde River.

Clearwater River basin.— A total of 172 redds were observed during eleven searches of the Clearwater River in 2000 (Tables 1, 5, and 7), although one of the searches was split between two days. Of the 172 redds counted, 163 were in the Clearwater River down river from the North Fork, eight were located in the Clearwater River upriver of the North Fork, and one was located in the South Fork Clearwater River. Redds counted in the Clearwater River basin amounted to 32% of all redds observed upriver of Lower Granite Dam in 2000, 32% in 1999, 26% in 1998, and 38% in 1997.

Observation conditions varied from “poor” to “good” during aerial searches of the Clearwater River in 2000 (Table 8). River discharge ranged from 3,060 cfs to 5,920 cfs at the Spaulding Gauge (RM 11).

The Middle Fork Clearwater and Selway rivers were searched in 2000, although no redds were observed (Tables 1 and 5).

Grande Ronde.— A total of eight redds were observed during seven searches of the Grande Ronde River in 2000 (Tables 1, 5 and 9). River discharge in the Grande Ronde River near Troy, Oregon (RM 45), ranged from 767 cfs to 1,070 cfs during the searches, and observation conditions were reported as “good” for all searches. The last two scheduled weekly searches were canceled because so few redds were observed up to that point and the peak of spawning had passed.

Salmon River.— No redds were observed during two searches of the Salmon River in 2000 (Tables 1 and 5). River discharge in the Salmon River ranged from 3,770 cfs to 3,830 cfs near White Bird, Idaho (RM 54), and search conditions were reported as “good”.

Imnaha River.— A total of nine redds were observed during nine searches of the Imnaha River in 2000 (Tables 1, 5, and 10). River discharge ranged from 150 cfs to 246 cfs near the town of Imnaha, Oregon (RM 19), and observation conditions were reported as “good”. One redd was observed above Cow Creek Bridge in 2000.

Overall. — A total of 2,323 adult fall chinook salmon passed Lower Granite Dam (D. Milks, WDFW, personal communication) and 536 redds were counted upriver in 2000. Thus, about one redd was counted for every four adult fish crossing the dam (Figure 2). Redd counts proceeded without mishap.

Summary and Conclusions

A total of 536 redds were observed upriver of Lower Granite Dam in 2000. Most of the redds (64%) were observed in the Snake River, followed by the Clearwater River basin (32%), the Imnaha River (2%), and the Grand Ronde River (1%).

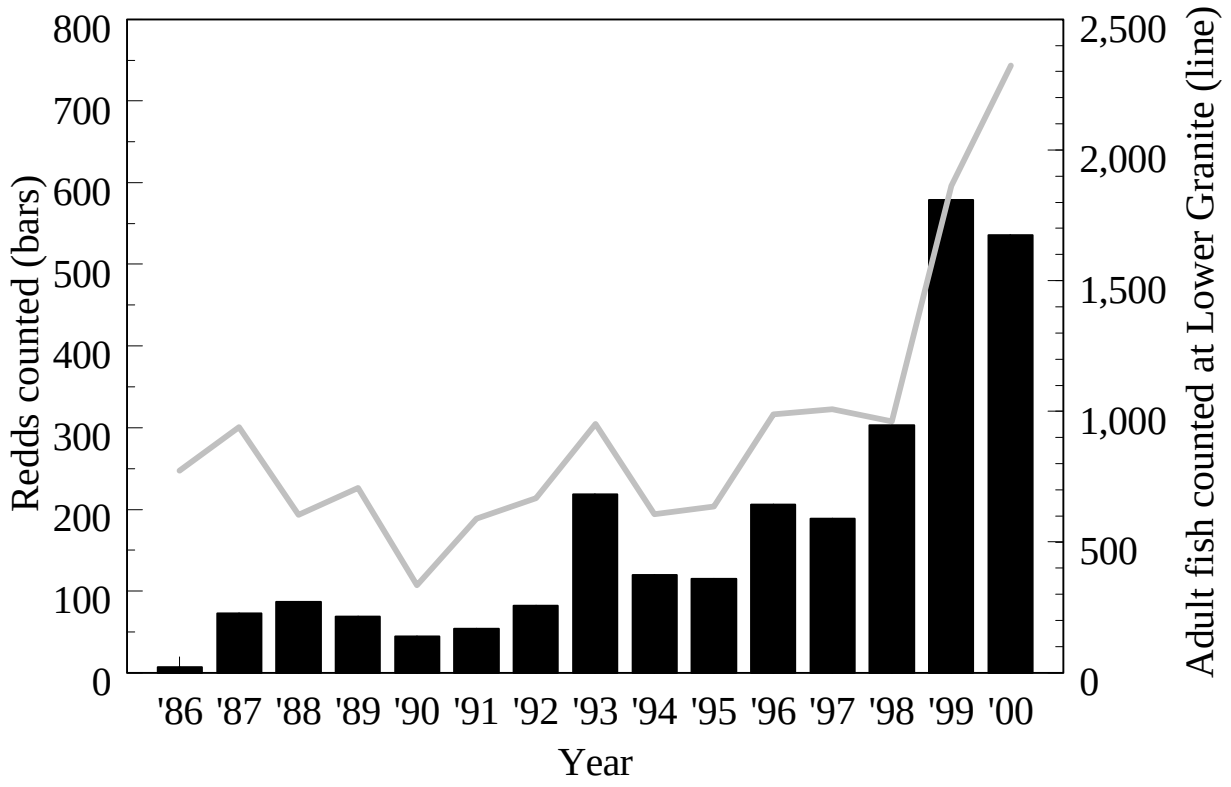

Figure 2. Number of adult fall chinook salmon counted at Lower Granite Dam, and number of redds counted above the dam, 1986-2000.

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Chapter 2 Tables

Table 1. Number of fall chinook salmon redds counted in the Snake River and tributaries between Lower Granite and Hells Canyon dams, 1986-2000. An empty cell indicates no searches were conducted in the corresponding river and year. Some of the data is broken down into method, and river mile (RM) sections.

River (method or RM)	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Snake (helicopter)[a]	7	66	64	58	37	41	47	60	53	41	71	49	135	273	255
Snake (underwater video)[b]						5	0	67	14	30	42	9	50	100	91
Clearwater (RM 0-41)			21	10	4	4	25	36	30	20	66	58	78	179	164
Clearwater (RM 41-74)							1	0	0	0	0	0	0	2	8
M.F. Clearwater (RM 74- 98)									0	0	0	0	0	0	0
N. F. Clearwater			0	0	0	0	0	0	7	0	2	14	0	1	0
S. F. Clearwater							0	0	0	0	1	0	0	2	1
Grande Ronde	0	7	1	0	1	0	5	49	15	18	20	55	24	13	8
Imnaha		0	1	1	3	4	3	4	0	4	3	3	13	9	9
Salmon							1	3	1	2	1	1	3	0	0
Selway									0	0	0	0	0	0	0
Totals	7	73	87	69	45	54	82	219	120	115	206	189	303	579	536

[a] The targeted search area was the entire reach from the head of Lower Granite Reservoir to Hells Canyon Dam.

[b] The targeted search areas were discrete sites composed mainly of 1-6 in. bottom substrates in water over 10 ft. deep. The number of sites searched varied.

Table 2. New fall chinook salmon redds counted during aerial searches of the Snake River in 2000. Counts are presented by river mile (RM), landmark (from USGS maps and USACE navigation charts), and date. An empty cell indicates no survey was conducted over the corresponding river mile, and a dash (-) indicates no redd were found on the corresponding date.

		New redds counted by flight date									Site
RM	Landmark	09-Oct	16-Oct	23-Oct	30-Oct	06-Nov	13-Nov	20-Nov	28-Nov	04-Dec	totals
148.5	Water mill foundation	-	-	-	-	3	1	1	-	-	5
152.3	Big Bench Point	-	-	-	-	10	7	3	1	-	21
156.8	Idaho-side bar (Smolt hole)	-	-	-	1	-	-	-	-	-	1
160.8	Between BR ranges 1 & 2	-	-	-	-	-	1	-	-	-	1
161.0	Upper Buffalo Rapids	-	-	-	-	3	1	2	1	-	7
162.4	Captain Johns Creek	-	-	-	-	-	1	2	1	-	4
172.5	Deer Head Rapids	-	-	-	-	-	1	-	-	-	1
173.9	Shovel Creek	-	-	-	-	-	1	-	-	-	1
176.5	Grotto Falls	-	-	-	-	-	2	-	-	-	2
178.5	Mid Cochran	-	-	-	-	-	2	-	-	-	2
178.9	Upper Cochran Range	-	-	-	3	4	6	-	-	-	13
179.6	Cougar Bar Range No. 4	-	-	-	-	3	4	1	-	-	8
181.7	Meat Hole	-	-	-	-	-	-	1	-	-	1
188.2	Landing Strip	-	-	2	-	-	-	-	-	-	2
190.8	Eureka Bar	-	-	-	3	2	-	-	-	-	5
193.7	Divide-to-Zig Zag	-	-	1	2	1	1	-	-	-	5
193.8	Big Canyon Creek	-	-	-	-	2	-	-	-	-	2
194.0	Big Canyon Range	-	-	-	4	2	4	1	-	-	11
196.0	Rapid No. 97	-	1	1	3	4	-	-	1	-	10
198.2	Camp 71 site	-	-	-	5	1	2	1	-	-	9
198.8	Robinson Gulch	-	1	2	2	5	2	1	-	-	13
201.1	Christmas Creek	-	-	-	-	1	-	-	-	-	1
205.3	Copper Creek	-	-	-	-	-	2	-	-	-	2
205.4	Copper Creek-to-Getta Creek	-	-	-	2	2	-	-	-	-	4

Table 2 (continued).

RM	Landmark	New redds counted by flight date									Site totals
		09-Oct	16-Oct	23-Oct	30-Oct	06-Nov	13-Nov	20-Nov	28-Nov	04-Dec	
207.7	Rapid No. 117	-	-	-	-	1	-	-	-	-	1
208.0	Forest Boundary	-	1	-	13	2	-	-	1	-	17
211.9	McCarty Creek	-	-	2	2	2	-	-	-	-	6
213.3	Lower Pleasant Dam Site	-	-	-	-	-	1	-	-	-	1
213.5	Rapids No. 127	-	-	-	1	-	-	-	-	-	1
213.7	Lower Pleasant Rapid No.128	-	-	-	1	-	-	-	-	-	1
216.1	Klopton Creek (OR side)	-	-	-	2	-	-	-	-	-	2
216.9	Match Line	-	-	-	3	2	-	-	-	-	5
217.3	Coral Creek Reef	-	-	-	4	2	-	-	-	-	6
218.5	Kirby Range No. 1	-	-	-	-	-	-	2	-	-	2
218.7	Kirby Range No. 2	-	-	-	3	2	-	-	-	-	5
219.0	Middle Kirby Rapids No. 137	-	-	-	4	2	-	-	-	-	6
219.3	Kirby Range No. 5	-	-	1	2	1	-	1	-	-	5
222.8	Middle Suicide (OR side)	-	-	-	3	1	1	-	-	-	5
235.1	Bernard Creek	-	-	1	2	-	-	-	-	-	3
235.7	Hat Creek	1	-	2	4	5	4	-	-	-	16
236.0	Saddle Creek	-	-	-	-	-	1	-	-	-	1
236.1	Oregon side	-	-	-	-	1	-	-	-	-	1
237.0	Lower Dry Gulch	-	-	1	4	3	5	-	-	-	13
238.3	Three Creeks Rapids #2	-	-	-	-	1	-	-	-	-	1
238.6	Three Creek Rapids #1	-	-	1	-	2	1	-	-	-	4
240.5	Granite Ck-to-Rocky Bar site	-	-	-	1	-	-	-	-	-	1
240.7	Rocky Bar Camp	-	1	2	4	4	-	-	-	-	11
242.8	Barton Cabin	-	-	-	-	3	1	-	-	-	4
243.3	Warm Springs Camp	-	-	1	1	2	-	-	-	-	4
244.6	Brush Creek	-	-	1	1	-	-	-	-	-	2
	Totals	1	4	18	80	79	52	16	5	0	255

Table 3. Record of fall chinook salmon redds counted in the Snake River using submersible cameras in 2000. Counts are presented by river mile (RM), landmark (from USGS maps and USACE navigation charts), search dates, and depth ranges of redds. Individual redds were identified at all sites in 2000.

RM	Landmark	Number of redds	Search Dates 1	2	3	4	Redd Depth Range (feet)
166.6	Lower Lewis	1	16-Nov	17-Nov			14
179.6	Cougar Bar	48	15-Nov	16-Nov			>10
198.2	Tiger Rock	5	1-Dec				9.5-16.5
198.8	Robinson Gulch	4	29-Nov				>10
199.4	Trail Gulch	1	29-Nov				>10
212.2	Davis Creek	28	27-Nov	28-Nov	29-Nov	7-Dec	11-16
212.3	Above Davis	3	27-Nov	28-Nov			10-13
218.5	Kirby Back Eddy	1	7-Dec				>10
	Total	91					

Table 4. List of the 60 sites searched for fall chinook salmon redds in the Snake River, 2000, by river mile (RM), and first date searched.

RM	Date	RM	Date	RM	Date
139.5	27-Nov	172.8	08-Dec	203.9	01-Dec
144.7	14-Nov	177.6	22-Nov	204.9	01-Dec
147.3	04-Dec	178.6	06-Dec	208.0	29-Nov
148.5	15-Nov	179.6	15-Nov	208.3	29-Nov
150.5	20-Nov	183.1	22-Nov	209.9	29-Nov
151.5	04-Dec	184.7	28-Nov	212.2	27-Nov
153.2	20-Nov	186.6	28-Nov	212.3	27-Nov
154.3	20-Nov	188.2	28-Nov	213.3	28-Nov
155.6	15-Nov	190.0	28-Nov	215.3	08-Dec
158.0	09-Nov	192.5	28-Nov	216.9	07-Dec
162.4	15-Nov	193.5	04-Dec	218.5	07-Dec
163.7	16-Nov	193.7	04-Dec	221.0	29-Nov
164.4	20-Nov	193.8	04-Dec	222.3	07-Dec
165.7	16-Nov	194.4	N.D.	222.5	07-Dec
166.2	17-Nov	194.6	08-Dec	222.8	07-Dec
166.6	16-Nov	198.2	01-Dec	223.1	07-Dec
167.5	21-Nov	198.8	29-Nov	227.5	28-Nov
171.4	17-Nov	199.4	29-Nov	227.9	28-Nov
171.9	08-Dec	202.0	08-Dec	228.0	28-Nov
172.3	21-Nov	203.1	27-Nov	235.0	30-Nov

Table 5. Number of redd searches conducted in the Snake River and tributaries between Lower Granite and Hells Canyon dams, 1986-2000. Data for underwater searches indicates the number of discrete patches of gravels searched, whereas all other data indicates the number of helicopter flights over portions of the corresponding river. River miles (RM) are shown for continuous sections of the Clearwater River.

	Year														
River (search method or RM)	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Snake (helicopter)	1	2	2	2	3	9	8	8	8	7	7	8	8	9	9
Snake (underwater video)						1	3	50	73	42	32	63	48	73	60
Clearwater (RM 0-41)			1	2	2	2	2	5	5	3	4	9	5	10	11
Clearwater (RM 41-74)									5	2	1	7	5	8	11
M.F. Clearwater (RM 74-98)									1	2	2	2	5	3	4
N.F. Clearwater							2	4	5	3	5	9	5	7	11
S.F. Clearwater							2	4	4	1	3	7	5	8	6
Grande Ronde	1	3	2	1	1	3	6	8	7	3	4	8	6	7	7
Imnaha		1	2	2	1	9	6	8	8	6	5	7	6	9	9
Salmon							2	3	3	1	4	3	3	3	2
Selway									1	2	2	2	5	3	5

Table 6. Flight information, river discharge, and observation conditions for redd searches conducted over the Snake River in 2000.

	Flight Date								
Category	09-Oct	16-Oct	23-Oct	30-Oct	06-Nov	13-Nov	20-Nov	28-Nov	04-Dec
River mile start	147	147	147	147	147	147	147	147	147
River mile end	247	247	247	247	247	247	247	247	247
Flow at Hells Canyon Dam	N.D.	9,470	9,520	9,820	9,960	9,800	9,740	10,100	10,000
Flow at Anatone	N.D.	16,400	16,500	16,400	15,700	15,000	14,400	15,200	14,700
Overall observation rating for flight	Fair	Fair	Fair	Good	Good	Good	Good	Good	Good
Asotin to Grande Ronde River	Poor	Poor	Fair	Good	Good	Good	Good	Good	Good
Grande Ronde River to Salmon River	Poor	Poor	Fair	Good	Good	Good	Good	Good	Good
Salmon River to Hells Canyon Dam	Good	Good	Good	Good	Good	Good	Good	Good	Good

Table 7. New fall chinook salmon redds counted in the Clearwater River in 2000 (B. Arnsberg, NPT, unpublished data). Counts are presented by river mile (RM), landmark, and date. A dash (-) indicates no redds were found on the corresponding date. An empty cell indicates no search was conducted at the corresponding river mile.

		New Redds Counted by Flight Date											
RM	Landmark	26-Sep	5-Oct	10-Oct	17-Oct	25-Oct	1-Nov	2-Nov	7-Nov	14-Nov	20-Nov	28-Nov	6-Dec	Totals
8.0	Below Historic Stop	-	-	-	-	-	-		-	-	-	-	-	0
13.9	Islands Below Potlatch River	-	1	-	-	-	5		2	-	-	-	-	8
17.3	Island Above Gibbs Eddy	-	-	-	-	-	-		-	-	-	-	-	0
18.0	Lower Myrtle	-	-	-	-	-	2		-	-	-	-	-	2
18.9	At Myrtle Under Power line	-	-	-	-	-	-		-	-	-	-	-	0
19.1	Lower Cottonwood	-	-	-	-	-	-		-	-	-	-	-	0
19.5	Mid-Cottonwood Island	-	-	-	-	-	4		3	-	-	-	-	7
21.8	Lower Fir Island	-	-	-	-	-	-		-	-	-	-	-	0
22.0	Fir Island (Cherry Lane)	-	-	6	6	3	20		15	14	3	10	-	77
26.5	Above Bedrock Creek	-	-	-	-	-	-		-	3	-	-	-	3
28.3	Below Lenore Bridge	-	-	-	-	-	1		-	-	-	-	-	1
32.5	Below Tomahawk	-	-	-	-	-	10		1	2	-	-	-	13
33.8	Below Leaning Pine Hole	-	-	-	-	-	-		-	6	-	-	-	6
34.0	Leaning Pine Hole	-	-	-	-	-	2		-	-	-	-	-	2
35.4	Above Old Peck Bridge	-	-	-	1	-	6		2	-	-	-	-	9
35.7	Above Old Peck Bridge	-	-	-	-	-	-		-	-	-	-	-	0
36.2	Above Old Peck Bridge	-	-	-	-	-	-		7	4	-	-	-	11
39.6	Above Pink House	-	-	-	-	-	-		-	-	-	-	-	0
40.3	Ahsahka Islands	-	-	-	-	-		-	9	9	2	2	-	22
40.6	At NF Clearwater Confluence	-	-	-	-	-		3	-	-	-	-	-	3
45.0	Above Orofino Creek	-	-	-	-	-		3	-	-	-	-	-	3
49.2	Above Ford's Creek	-	-	-	-	-		1	-	-	-	-	-	1
51.7	0.8 Miles below Greer bridge	-	-	-	-	1		2	-	-	-	-	-	3
53.7	Historical Marker (Greer Tavern)	-	-	-	-	-		-	-	-	-	-	-	0
61.0	Hwy 12 Mile Post 59.5	-	-	-	-	-		1	-	-	-	-	-	1
	Totals	0	1	6	7	4	60		39	38	5	12	0	172

Table 8. Flight information, river discharge, and observation conditions for redd searches conducted over the Clearwater River in 2000 (B. Arnsberg, NPT, unpublished data).

	Flight date											
Landmark	26-Sep	5-Oct	10-Oct	17-Oct	25-Oct	1-Nov	2-Nov	7-Nov	14-Nov	20-Nov	28-Nov	6-Dec
River Mile Start	0	0	0	0	0	0	39	0	0	0	0	0
River Mile End	74.5	74.5	74.5	74.5	74.5	39	74.5	74.5	74.5	66	74.5	74.5
Flow at Spalding Gauge	3,060	5,210	3,940	5,920	5,970	5,230	5,160	4,790	3,890	3,520	3,960	3,590
Flow at Peck Gauge	3,020	5,130	4,040	5,820	5,920	5,210	5,160	4,730	3,780	3,430	3,940	3,540
Flow at Orofino Gauge	1,470	3,449	2,250	3,970	4,250	3,459	3,400	3,060	2,160	1,950	2,470	2,120
General Observation Conditions	Good	Poor	Poor	Fair	Poor	Good	Good	Good	Good	Good	Good	Good

Table 9. New fall chinook salmon redds counted during aerial searches of the Grande Ronde River, 2000. Counts are presented by river mile (RM), landmark, and date. A dash (-) indicates no redds were found on the corresponding date.

		New redds counted by flight date							Site
RM	Landmark	9-Oct	16-Oct	23-Oct	30-Oct	6-Nov	13-Nov	20-Nov	totals
3.6	Top of Island above ranch	-	-	1	-	-	-	-	1
4.4	Joseph Creek	-	-	-	-	-	1	-	1
37.6	Horseshoe bend	-	2	-	-	-	-	-	2
44.9	Below Troy	-	1	-	2	-	1	-	4
	Totals	0	3	1	2	0	2	0	8
	River mile start	0	0	0	0	0	0	0	
	River mile end	53	53	53	53	53	53	53	

Table 10. New fall chinook salmon redds counted during air and ground surveys of the Imnaha River in 2000. Counts are presented by river mile (RM), river kilometer (RK), landmark, and date. A dash (-) indicates no redd were found on the corresponding date.

		New redds counted by flight date									Site
RM	Landmark	09-Oct	16-Oct	23-Oct	30-Oct	06-Nov	13-Nov	20-Nov	27-Nov	04-Dec	totals
0.5	Pool one	-	-	1	-	-	-	-	-	-	1
0.6	Pool two	-	-	-	1	1	-	-	-	-	2
2.4	Under power line	-	-	-	-	2	-	-	-	-	2
3.0	Below creek	-	-	-	-	2	-	-	-	-	2
4.1	Cow Creek Bridge	-	-	-	-	-	1	-	-	-	1
6.5	Above Corral Creek	-	-	-	-	-	1	-	-	-	1
		0	0	1	1	5	2	0	0	0	9
	River mile start	0	0	0	0	0	0	0	0	0	
	River mile end	4	4	4	4	4	35	4	4	4	
	Flow at Imnaha	N.D.	190	192	246	186	155	150	163	155	
	Observation conditions	Good	Good	Good	Good	Good	Good	Good	Good	Good	

Appendix 1

Fall chinook salmon tagging records by release site and age at release for all fish tagged.

Count	Tag Chan	Tag Code	Release River	Release Site	Age at Release	Release Year	Return Year	Length (cm) At Return	Sex	Spawning River	Spawning Rm	Known Loss
1	19	36	CLW	BIG CAN	SUB	1996	1999	76	F	CLW	33.0	
2	19	121	CLW	BIG CAN	SUB	1996	1999	73	F	CLW	28	
3	19	87	CLW	BIG CAN	SUB	1998	2000	72	F	CLW	22.0	
4	18	3	CLW	BIG CAN	SUB	1996	2000	81	F			
5	18	44	CLW	BIG CAN	SUB	1997	2000	72	F			
6	19	96	CLW	BIG CAN	SUB	1997	2000		F			
7	13	2	CLW	BIG CAN	YRLNG	1997	1999	68	F	CLW	22.0	
8	19	22	CLW	BIG CAN	YRLNG	1997	1999	78	F	CLW	22.0	
9	19	44	CLW	BIG CAN	YRLNG	1997	1999	67	F	CLW	39.0	
10	19	57	CLW	BIG CAN	YRLNG	1997	1999	81	F	CLW	22.0	
11	19	91	CLW	BIG CAN	YRLNG	1997	1999	82	F	CLW	19.5	
12	19	95	CLW	BIG CAN	YRLNG	1997	1999	87	F	CLW	32.0	
13	19	111	CLW	BIG CAN	YRLNG	1997	1999	79	F	CLW	22.0	
14	19	116	CLW	BIG CAN	YRLNG	1997	1999	74	F	CLW	28.3	
15	19	167	CLW	BIG CAN	YRLNG	1997	1999	75	F	CLW	39	
16	18	29	CLW	BIG CAN	YRLNG	UNKNOWN	2000	75	F	CLW	21.7	
17	18	104	CLW	BIG CAN	YRLNG	UNKNOWN	2000	64	M	CLW	40.7	
18	18	105	CLW	BIG CAN	YRLNG	UNKNOWN	2000	64	F	CLW	35.1	
19	18	107	CLW	BIG CAN	YRLNG	UNKNOWN	2000	81	F	CLW	40.0	
20	18	123	CLW	BIG CAN	YRLNG	UNKNOWN	2000	84	F	CLW	32.0	
21	18	128	CLW	BIG CAN	YRLNG	UNKNOWN	2000	62	M	CLW	22.0	
22	19	10	CLW	BIG CAN	YRLNG	UNKNOWN	2000	63	M	CLW	18.1	
23	19	76	CLW	BIG CAN	YRLNG	UNKNOWN	2000	88	F	CLW	36.2	
24	19	86	CLW	BIG CAN	YRLNG	UNKNOWN	2000	62	F	CLW	22.0	
25	19	133	CLW	BIG CAN	YRLNG	UNKNOWN	2000	61	M	CLW	33.8	
26	19	151	CLW	BIG CAN	YRLNG	UNKNOWN	2000	80	F	CLW	26.5	

Appendix 1 (continued)

Fall chinook salmon tagging records by release site and age at release for all fish tagged.

SEQ. NO.	TAG CHAN	TAG CODE	RELEASE RIVER	RELEASE SITE	AGE AT RELEASE	MIGRATION YEAR	RADIO TAG YEAR	LENGTH AT RETURN	SEX	SPAWNING RIVER	SPAWNING RM	KNOWN LOSS
27	13	9	CLW	BIG CAN	YRLNG	1997	1999	72	F			
28	13	15	CLW	BIG CAN	YRLNG	1997	1999	74	F			
29	13	20	CLW	BIG CAN	YRLNG	1997	1999	63	F			
30	13	107	CLW	BIG CAN	YRLNG	1997	1999	72	F			
31	13	119	CLW	BIG CAN	YRLNG	1997	1999	73	F			
32	13	128	CLW	BIG CAN	YRLNG	1997	1999	76	F			YES
33	13	139	CLW	BIG CAN	YRLNG	1997	1999	78	F			
34	13	142	CLW	BIG CAN	YRLNG	1997	1999	66	F			
35	13	157	CLW	BIG CAN	YRLNG	1997	1999	76	F			
36	19	27	CLW	BIG CAN	YRLNG	1997	1999	75	F			YES
37	19	51	CLW	BIG CAN	YRLNG	1997	1999	75	F			YES
38	19	71	CLW	BIG CAN	YRLNG	1997	1999	73	F			
39	19	72	CLW	BIG CAN	YRLNG	1997	1999	66	F			
40	19	73	CLW	BIG CAN	YRLNG	1997	1999	76	F			
41	19	75	CLW	BIG CAN	YRLNG	1997	1999	75	F			
42	19	82	CLW	BIG CAN	YRLNG	1997	1999	68	F			
43	18	39	CLW	BIG CAN	YRLNG	UNKNOWN	2000	64	M			
44	18	48	CLW	BIG CAN	YRLNG	UNKNOWN	2000	72	F			
45	18	49	CLW	BIG CAN	YRLNG	UNKNOWN	2000	77	F			
46	18	55	CLW	BIG CAN	YRLNG	UNKNOWN	2000	69	F			
47	18	72	CLW	BIG CAN	YRLNG	UNKNOWN	2000	65	M			
48	18	84	CLW	BIG CAN	YRLNG	UNKNOWN	2000	80	F			
49	18	88	CLW	BIG CAN	YRLNG	UNKNOWN	2000	79	F			
50	18	89	CLW	BIG CAN	YRLNG	UNKNOWN	2000	61	M			
51	18	91	CLW	BIG CAN	YRLNG	UNKNOWN	2000	79	F			
52	18	98	CLW	BIG CAN	YRLNG	UNKNOWN	2000	86	F			
53	18	99	CLW	BIG CAN	YRLNG	UNKNOWN	2000	75	F			
54	18	109	CLW	BIG CAN	YRLNG	UNKNOWN	2000	65	M			
55	18	112	CLW	BIG CAN	YRLNG	UNKNOWN	2000	71	F			
56	18	114	CLW	BIG CAN	YRLNG	UNKNOWN	2000	64	M			
57	18	140	CLW	BIG CAN	YRLNG	UNKNOWN	2000	61	M			YES
58	18	141	CLW	BIG CAN	YRLNG	UNKNOWN	2000	62	M			

Appendix 1 (continued)

Fall chinook salmon tagging records by release site and age at release for all fish tagged.

SEQ. NO.	TAG CHAN	TAG CODE	RELEASE RIVER	RELEASE SITE	AGE AT RELEASE	MIGRATION YEAR	RADIO TAG YEAR	LENGTH AT RETURN	SEX	SPAWNING RIVER	SPAWNING RM	KNOWN LOSS
59	18	153	CLW	BIG CAN	YRLNG	UNKNOWN	2000	61	M			
60	18	156	CLW	BIG CAN	YRLNG	UNKNOWN	2000	64	M			
61	18	160	CLW	BIG CAN	YRLNG	UNKNOWN	2000	62	F			
62	18	163	CLW	BIG CAN	YRLNG	UNKNOWN	2000	61	M			
63	19	16	CLW	BIG CAN	YRLNG	UNKNOWN	2000	65	M			
64	19	25	CLW	BIG CAN	YRLNG	UNKNOWN	2000	66	F			
65	19	50	CLW	BIG CAN	YRLNG	UNKNOWN	2000	64	F			
66	19	54	CLW	BIG CAN	YRLNG	UNKNOWN	2000	68	M			
67	19	60	CLW	BIG CAN	YRLNG	UNKNOWN	2000	71	F			
68	19	69	CLW	BIG CAN	YRLNG	UNKNOWN	2000	62	F			
69	19	89	CLW	BIG CAN	YRLNG	UNKNOWN	2000	83	M			
70	19	94	CLW	BIG CAN	YRLNG	UNKNOWN	2000	75	F			
71	19	97	CLW	BIG CAN	YRLNG	UNKNOWN	2000	64	M			
72	19	112	CLW	BIG CAN	YRLNG	UNKNOWN	2000	60	M			
73	19	125	CLW	BIG CAN	YRLNG	UNKNOWN	2000	69	F			
74	19	139	CLW	BIG CAN	YRLNG	UNKNOWN	2000	74	F			
75	19	153	CLW	BIG CAN	YRLNG	UNKNOWN	2000	74	F			YES
76	19	158	CLW	BIG CAN	YRLNG	UNKNOWN	2000	78	F			
77	19	28	CLW	BIG CAN	YRLNG	1997	1999	71	F	SNR	152.5	
78	19	93	CLW	BIG CAN	YRLNG	1997	1999	66	F	SNR	217.3	
79	19	152	CLW	BIG CAN	YRLNG	1997	1999	68	F	SNR	179.6	
80	18	140	CLW	BIG CAN	YRLNG	UNKNOWN	2000	84	M	SNR	152.0	
81	19	36	CLW	BIG CAN	YRLNG	UNKNOWN	2000	62	M	SNR	194.0	
82	19	160	CLW	BIG CAN	YRLNG	UNKNOWN	2000	65	F			
83	24	39	CLW	BIG CAN	YRLNG	1997	1998	55	M			
84	24	50	CLW	BIG CAN	YRLNG	1997	1998	55	M			
85	24	51	CLW	BIG CAN	YRLNG	1997	1998	53	M			
86	25	3	CLW	BIG CAN	YRLNG	1997	1998	50	M			
87	25	4	CLW	BIG CAN	YRLNG	1997	1998	58	M			
88	25	18	CLW	BIG CAN	YRLNG	1997	1998	54	M			
89	25	22	CLW	BIG CAN	YRLNG	1997	1998	57	M			
90	25	36	CLW	BIG CAN	YRLNG	1997	1998	56	M			

Appendix 1 (continued)

Fall chinook salmon tagging records by release site and age at release for all fish tagged.

SEQ. NO.	TAG CHAN	TAG CODE	RELEASE RIVER	RELEASE SITE	AGE AT RELEASE	MIGRATION YEAR	RADIO TAG YEAR	LENGTH AT RETURN	SEX	SPAWNING RIVER	SPAWNING RM	KNOWN LOSS
91	24	15	CLW	BIG CAN	YRLNG	1997	1998	57	M			
92	24	55	CLW	BIG CAN	YRLNG	1997	1998	50	M			
93	24	58	CLW	BIG CAN	YRLNG	1997	1998	55	M			
94	24	113	CLW	BIG CAN	YRLNG	1997	1998	60	M			
95	25	143	CLW	BIG CAN	YRLNG	1997	1998	64	M			
96	25	17	CLW	BIG CAN	YRLNG	1997	1998	55	M			
97	24	71	CLW	BIG CAN	YRLNG	1997	1998	60	M			
98	16	36	SNR	BILLY C	SUB	1995	1997	67	M			
99	10	20	SNR	BILLY C	SUB	1995	1998	93	M			
100	10	154	SNR	BILLY C	SUB	1995	1998	75	F			
101	10	157	SNR	BILLY C	SUB	1995	1998	74	F			
102	24	130	SNR	BILLY C	SUB	1995	1998	78	F			
103	18	81	SNR	BILLY C	SUB	1998	2000	62	M			
104	19	144	SNR	BILLY C	SUB	1997	2000	75	F			
105	10	28	SNR	BILLY C	SUB	1995	1998	81	F	SNR	194.0	
106	10	150	SNR	BILLY C	SUB	1995	1998	82	F	SNR	179.6	
107	24	132	SNR	BILLY C	SUB	1995	1998	76	F	SNR	194.0	
108	15	57	SNR	BILLY C	SUB	1995	1997	71	M			
109	25	134	SNR	BILLY C	SUB	1995	1998	84	F			
110	18	97	SNR	CAP JON	YRLNG	UNKNOWN	2000	69	F	CLW	36.0	
111	18	8	SNR	CAP JON	YRLNG	UNKNOWN	2000	70	F			
112	18	12	SNR	CAP JON	YRLNG	UNKNOWN	2000	69	F			
113	18	16	SNR	CAP JON	YRLNG	UNKNOWN	2000	76	F			
114	18	19	SNR	CAP JON	YRLNG	UNKNOWN	2000	66	F			
115	18	22	SNR	CAP JON	YRLNG	UNKNOWN	2000	72	M			
116	18	27	SNR	CAP JON	YRLNG	UNKNOWN	2000	76	F			
117	18	42	SNR	CAP JON	YRLNG	UNKNOWN	2000	64	F			
118	18	82	SNR	CAP JON	YRLNG	UNKNOWN	2000	64	F			
119	18	86	SNR	CAP JON	YRLNG	UNKNOWN	2000	69	M			
120	18	102	SNR	CAP JON	YRLNG	UNKNOWN	2000	75	F			
121	18	124	SNR	CAP JON	YRLNG	UNKNOWN	2000	60	M			
122	18	152	SNR	CAP JON	YRLNG	UNKNOWN	2000	70	F			

Appendix 1 (continued)

Fall chinook salmon tagging records by release site and age at release for all fish tagged.

SEQ. NO.	TAG CHAN	TAG CODE	RELEASE RIVER	RELEASE SITE	AGE AT RELEASE	MIGRATION YEAR	RADIO TAG YEAR	LENGTH AT RETURN	SEX	SPAWNING RIVER	SPAWNING RM	KNOWN LOSS
123	19	3	SNR	CAP JON	YRLNG	UNKNOWN	2000	62	F			
124	19	35	SNR	CAP JON	YRLNG	UNKNOWN	2000	66	F			
125	19	47	SNR	CAP JON	YRLNG	UNKNOWN	2000	68	F			
126	19	55	SNR	CAP JON	YRLNG	UNKNOWN	2000	79	F			
127	19	57	SNR	CAP JON	YRLNG	UNKNOWN	2000	63	M			
128	19	71	SNR	CAP JON	YRLNG	UNKNOWN	2000	65	M			
129	19	75	SNR	CAP JON	YRLNG	UNKNOWN	2000	64	F			
130	19	118	SNR	CAP JON	YRLNG	UNKNOWN	2000	62	F			
131	19	122	SNR	CAP JON	YRLNG	UNKNOWN	2000	63	M			
132	19	127	SNR	CAP JON	YRLNG	UNKNOWN	2000	65	M			
133	19	129	SNR	CAP JON	YRLNG	UNKNOWN	2000	60	M			
134	19	142	SNR	CAP JON	YRLNG	UNKNOWN	2000	75	F			
135	19	153	SNR	CAP JON	YRLNG	UNKNOWN	2000	65	M			
136	19	159	SNR	CAP JON	YRLNG	UNKNOWN	2000	64	F			
137	19	170	SNR	CAP JON	YRLNG	UNKNOWN	2000	62	M			
138	18	25	SNR	CAP JON	YRLNG	UNKNOWN	2000	63	M	SNR	179.6	
139	18	70	SNR	CAP JON	YRLNG	UNKNOWN	2000	72	F	SNR	208.0	
140	18	157	SNR	CAP JON	YRLNG	UNKNOWN	2000	64	M	SNR	179.6	
141	19	34	SNR	CAP JON	YRLNG	UNKNOWN	2000	71	F	SNR	161.0	
142	19	42	SNR	CAP JON	YRLNG	UNKNOWN	2000	68	M	SNR	179.6	
143	19	117	SNR	CAP JON	YRLNG	UNKNOWN	2000	74	F	SNR	152.3	
144	13	28	SNR	CAP JON	YRLNG	1998	1999	55	M			
145	13	160	SNR	CAP JON	YRLNG	1998	1999	57	M			
146	13	36	SNR	CAP JON	YRLNG	1998	1999	51	M			
147	13	44	SNR	CAP JON	YRLNG	1998	1999	52	M			
148	13	48	SNR	CAP JON	YRLNG	1998	1999	55	M			
149	13	24	SNR	CAP JON	YRLNG	1998	1999	53	M			
150	13	35	SNR	CAP JON	YRLNG	1998	1999	51	M			
151	13	39	SNR	CAP JON	YRLNG	1998	1999	51	M			
152	13	46	SNR	CAP JON	YRLNG	1998	1999	50	M			
153	13	47	SNR	CAP JON	YRLNG	1998	1999	53	M			
154	13	52	SNR	CAP JON	YRLNG	1998	1999	59	M			

Appendix 1 (continued)

Fall chinook salmon tagging records by release site and age at release for all fish tagged.

SEQ. NO.	TAG CHAN	TAG CODE	RELEASE RIVER	RELEASE SITE	AGE AT RELEASE	MIGRATION YEAR	RADIO TAG YEAR	LENGTH AT RETURN	SEX	SPAWNING RIVER	SPAWNING RM	KNOWN LOSS
155	13	56	SNR	CAP JON	YRLNG	1998	1999	54	M			
156	13	37	SNR	CAP JON	YRLNG	1998	1999	57	M			
157	13	63	SNR	CAP JON	YRLNG	1998	1999	55	M			
158	10	19	CLW	CLW	WILD	1994	1998	94	M	CLW	19.1	
159	15	55	GRR	GRR	WILD	1994	1997	66	M			
160	15	50	SNR	PITTS	SUB	1995	1997	65	M			
161	10	44	SNR	PITTS	SUB	1995	1998	77	F			
162	25	82	SNR	PITTS	SUB	1995	1998	72	F			
163	19	34	SNR	PITTS	SUB	1997	1999	65	F			
164	19	149	SNR	PITTS	SUB	1997	1999	66	F	SNR	206.4	
165	18	130	SNR	PITTS	SUB	1998	2000	64	M			
166	19	67	SNR	PITTS	SUB	1997	2000	77	F			
167	19	100	SNR	PITTS	SUB	1997	2000	66	F			
168	10	18	SNR	PITTS	SUB	1995	1998	88	F	SNR	237.0	
169	10	39	SNR	PITTS	SUB	1995	1998	91	F	SNR	235.7	
170	10	148	SNR	PITTS	SUB	1995	1998	70	F	SNR	212.0	
171	24	80	SNR	PITTS	SUB	1995	1998	90	F	SNR	208.0	
172	25	108	SNR	PITTS	SUB	1995	1998	74	F	SNR	235.0	
173	19	25	SNR	PITTS	SUB	1996	1999	78	F	SNR	194.0	
174	19	70	SNR	PITTS	SUB	1997	1999	61	F	SNR	236.0	
175	19	80	SNR	PITTS	SUB	1996	1999	58	F	SNR	209.7	
176	19	115	SNR	PITTS	SUB	1996	1999	67	F	SNR	219.3	
177	10	22	SNR	PITTS	YRLNG	1996	1998	79	F			
178	10	43	SNR	PITTS	YRLNG	1996	1998	69	F			
179	10	49	SNR	PITTS	YRLNG	1996	1998	72	F			
180	10	50	SNR	PITTS	YRLNG	1996	1998	83	F			
181	10	51	SNR	PITTS	YRLNG	1996	1998	73	F			
182	23	59	SNR	PITTS	YRLNG	1996	1998	74	F			
183	23	66	SNR	PITTS	YRLNG	1996	1998	70	F			YES
184	23	80	SNR	PITTS	YRLNG	1996	1998	74	F			YES
185	23	129	SNR	PITTS	YRLNG	1996	1998	70	F			
186	23	151	SNR	PITTS	YRLNG	1996	1998	73	F			

Appendix 1 (continued)

Fall chinook salmon tagging records by release site and age at release for all fish tagged.

SEQ. NO.	TAG CHAN	TAG CODE	RELEASE RIVER	RELEASE SITE	AGE AT RELEASE	MIGRATION YEAR	RADIO TAG YEAR	LENGTH AT RETURN	SEX	SPAWNING RIVER	SPAWNING RM	KNOWN LOSS
187	23	164	SNR	PITTS	YRLNG	1996	1998	67	F			
188	24	107	SNR	PITTS	YRLNG	1996	1998	66	F			YES
189	24	110	SNR	PITTS	YRLNG	1996	1998	60	F			YES
190	25	90	SNR	PITTS	YRLNG	1996	1998	67	F			
191	25	91	SNR	PITTS	YRLNG	1996	1998	74	F			
192	25	154	SNR	PITTS	YRLNG	1996	1998	71	F			
193	13	106	SNR	PITTS	YRLNG	1997	1999	68	F			
194	13	170	SNR	PITTS	YRLNG	1997	1999	67	M			
195	19	24	SNR	PITTS	YRLNG	1997	1999	71	F			
196	19	35	SNR	PITTS	YRLNG	1997	1999	71	F			
197	19	48	SNR	PITTS	YRLNG	1997	1999	75	F			
198	19	85	SNR	PITTS	YRLNG	1997	1999	79	F			
199	19	103	SNR	PITTS	YRLNG	1997	1999	76	F			
200	19	169	SNR	PITTS	YRLNG	1997	1999	78	F			
201	18	17	SNR	PITTS	YRLNG	UNKNOWN	2000	71	F			
202	18	45	SNR	PITTS	YRLNG	UNKNOWN	2000	62	M			
203	18	54	SNR	PITTS	YRLNG	UNKNOWN	2000	60	M			
204	18	78	SNR	PITTS	YRLNG	UNKNOWN	2000	63	M			
205	18	79	SNR	PITTS	YRLNG	UNKNOWN	2000	61	M			
206	18	93	SNR	PITTS	YRLNG	UNKNOWN	2000	66	M			
207	18	94	SNR	PITTS	YRLNG	UNKNOWN	2000	62	M			
208	18	101	SNR	PITTS	YRLNG	UNKNOWN	2000	67	F			
209	18	106	SNR	PITTS	YRLNG	UNKNOWN	2000	81	F			
210	18	127	SNR	PITTS	YRLNG	UNKNOWN	2000	62	M			
211	18	136	SNR	PITTS	YRLNG	UNKNOWN	2000	78	F			
212	18	137	SNR	PITTS	YRLNG	UNKNOWN	2000	62	F			
213	18	147	SNR	PITTS	YRLNG	UNKNOWN	2000	73	F			
214	18	159	SNR	PITTS	YRLNG	UNKNOWN	2000	74	M			
215	19	5	SNR	PITTS	YRLNG	UNKNOWN	2000	69	F			
216	19	14	SNR	PITTS	YRLNG	UNKNOWN	2000	63	M			
217	19	17	SNR	PITTS	YRLNG	UNKNOWN	2000	62	M			
218	19	20	SNR	PITTS	YRLNG	UNKNOWN	2000	65	M			

Appendix 1 (continued)

Fall chinook salmon tagging records by release site and age at release for all fish tagged.

SEQ. NO.	TAG CHAN	TAG CODE	RELEASE RIVER	RELEASE SITE	AGE AT RELEASE	MIGRATION YEAR	RADIO TAG YEAR	LENGTH AT RETURN	SEX	SPAWNING RIVER	SPAWNING RM	KNOWN LOSS
219	19	32	SNR	PITTS	YRLNG	UNKNOWN	2000	69	F			
220	19	33	SNR	PITTS	YRLNG	UNKNOWN	2000	84	M			
221	19	59	SNR	PITTS	YRLNG	UNKNOWN	2000	77	F			
222	19	114	SNR	PITTS	YRLNG	UNKNOWN	2000	73	F			
223	19	130	SNR	PITTS	YRLNG	UNKNOWN	2000	62	M			
224	19	149	SNR	PITTS	YRLNG	UNKNOWN	2000	62	M			
225	19	155	SNR	PITTS	YRLNG	UNKNOWN	2000	77	F			
226	19	164	SNR	PITTS	YRLNG	UNKNOWN	2000	80	F			
227	19	169	SNR	PITTS	YRLNG	UNKNOWN	2000	74	F			
228	10	25	SNR	PITTS	YRLNG	1996	1998	73	F	SNR	198.8	
229	10	26	SNR	PITTS	YRLNG	1996	1998	76	F	SNR	203.1	
230	10	45	SNR	PITTS	YRLNG	1996	1998	74	F	SNR	212.2	
231	10	46	SNR	PITTS	YRLNG	1996	1998	72	F	SNR	219.0	
232	10	47	SNR	PITTS	YRLNG	1996	1998	67	F	SNR	193.4	
233	10	48	SNR	PITTS	YRLNG	1996	1998	73	F	SNR	220.0	
234	23	166	SNR	PITTS	YRLNG	1996	1998	74	F	SNR	178.9	
235	24	75	SNR	PITTS	YRLNG	1996	1998	73	F	SNR	236.0	
236	24	99	SNR	PITTS	YRLNG	1996	1998	80	F	SNR	211.0	
237	24	134	SNR	PITTS	YRLNG	1996	1998	62	F	SNR	179.0	
238	25	117	SNR	PITTS	YRLNG	1996	1998	60	F	SNR	205.0	
239	25	121	SNR	PITTS	YRLNG	1996	1998	68	F	SNR	220.0	
240	25	137	SNR	PITTS	YRLNG	1996	1998	63	F	SNR	237.0	
241	25	152	SNR	PITTS	YRLNG	1996	1998	74	F	SNR	219.0	
242	13	4	SNR	PITTS	YRLNG	1997	1999	74	F	SNR	207.8	
243	19	23	SNR	PITTS	YRLNG	1996	1999	92	F	SNR	244.0	
244	19	37	SNR	PITTS	YRLNG	1997	1999	68	F	SNR	212.0	
245	19	41	SNR	PITTS	YRLNG	1997	1999	76	F	SNR	222.0	
246	19	59	SNR	PITTS	YRLNG	1997	1999	75	F	SNR	218.0	
247	19	84	SNR	PITTS	YRLNG	1996	1999	85	F	SNR	240.5	
248	19	88	SNR	PITTS	YRLNG	1996	1999	73	F	SNR	238.5	
249	19	106	SNR	PITTS	YRLNG	1997	1999	77	F	SNR	245.8	
250	19	108	SNR	PITTS	YRLNG	1997	1999	78	F	SNR	219.3	

Appendix 1 (continued)

Fall chinook salmon tagging records by release site and age at release for all fish tagged.

SEQ. NO.	TAG CHAN	TAG CODE	RELEASE RIVER	RELEASE SITE	AGE AT RELEASE	MIGRATION YEAR	RADIO TAG YEAR	LENGTH AT RETURN	SEX	SPAWNING RIVER	SPAWNING RM	KNOWN LOSS
251	19	118	SNR	PITTS	YRLNG	1997	1999	79	F	SNR	238.6	
252	19	142	SNR	PITTS	YRLNG	1997	1999	79	F	SNR	218	
253	19	170	SNR	PITTS	YRLNG	1997	1999	72	F	SNR	217.3	
254	18	10	SNR	PITTS	YRLNG	UNKNOWN	2000	72	F	SNR	235.1	
255	18	52	SNR	PITTS	YRLNG	UNKNOWN	2000	68	F	SNR	219.0	
256	18	90	SNR	PITTS	YRLNG	UNKNOWN	2000	65	F	SNR	198.2	
257	18	111	SNR	PITTS	YRLNG	UNKNOWN	2000	79	F	SNR	211.9	
258	18	132	SNR	PITTS	YRLNG	UNKNOWN	2000	73	F	SNR	208.0	
259	18	166	SNR	PITTS	YRLNG	UNKNOWN	2000	62	M	SNR	208.0	
260	18	169	SNR	PITTS	YRLNG	UNKNOWN	2000	76	F	SNR	236.0	
261	18	170	SNR	PITTS	YRLNG	UNKNOWN	2000	83	F	SNR	211.9	
262	19	38	SNR	PITTS	YRLNG	UNKNOWN	2000	79	F	SNR	218.6	
263	19	45	SNR	PITTS	YRLNG	UNKNOWN	2000	66	F	SNR	213.3	
264	19	72	SNR	PITTS	YRLNG	UNKNOWN	2000	66	F	SNR	208.0	
265	19	99	SNR	PITTS	YRLNG	UNKNOWN	2000	90	M	SNR	238.6	
266	19	106	SNR	PITTS	YRLNG	UNKNOWN	2000	63	M	SNR	152.3	
267	19	145	SNR	PITTS	YRLNG	UNKNOWN	2000	72	F	SNR	243.3	
268	19	162	SNR	PITTS	YRLNG	UNKNOWN	2000	67	F	SNR	190.1	
269	19	163	SNR	PITTS	YRLNG	UNKNOWN	2000	93	M	SNR	160.5	
270	15	14	SNR	PITTS	YRLNG	1996	1997	59	M			
271	15	16	SNR	PITTS	YRLNG	1996	1997	56	M			YES
272	15	69	SNR	PITTS	YRLNG	1996	1997	52	M			
273	15	99	SNR	PITTS	YRLNG	1996	1997	55	M			
274	15	100	SNR	PITTS	YRLNG	1996	1997	56	M			
275	16	85	SNR	PITTS	YRLNG	1996	1997	50	M			
276	15	15	SNR	PITTS	YRLNG	1996	1997	55	M			
277	15	20	SNR	PITTS	YRLNG	1996	1997	51	M			
278	15	22	SNR	PITTS	YRLNG	1996	1997	52	M			
279	15	40	SNR	PITTS	YRLNG	1996	1997	53	M			
280	15	74	SNR	PITTS	YRLNG	1996	1997	54	M			
281	16	17	SNR	PITTS	YRLNG	1996	1997	54	M			
282	16	46	SNR	PITTS	YRLNG	1996	1997	54	M			

Appendix 1 (continued)

Fall chinook salmon tagging records by release site and age at release for all fish tagged.

SEQ. NO.	TAG CHAN	TAG CODE	RELEASE RIVER	RELEASE SITE	AGE AT RELEASE	MIGRATION YEAR	RADIO TAG YEAR	LENGTH AT RETURN	SEX	SPAWNING RIVER	SPAWNING RM	KNOWN LOSS
283	16	56	SNR	PITTS	YRLNG	1996	1997	51	M			
284	16	72	SNR	PITTS	YRLNG	1996	1997	52	M			
285	16	89	SNR	PITTS	YRLNG	1996	1997	57	M			
286	15	80	SNR	SNR	WILD	1995	1997	61	M			
287	16	76	SNR	SNR	WILD	1995	1997	51	M			
288	19	92	SNR	SNR	WILD	1995	1999	80	F			
289	10	17	SNR	SNR	WILD	1994	1998	84	M	SNR	179.6	
290	23	135	SNR	SNR	WILD	1994	1998	83	F	SNR	215.4	
291	25	161	SNR	SNR	WILD	1995	1998	80	F	SNR	193.8	
292	19	97	SNR	SNR	WILD	1995	1999	102	M	SNR	219.3	
293	19	103	SNR	SNR	WILD	1995	1999	72	M	SNR	237.0	

Appendix 2

Summary of river entries and spawning locations for radio tagged fall chinook salmon.

All fish

293	= Total number of fish tagged				
228	or	78%	of	293	Entered free-flowing water (Snake River entry = arrival at RM 149)
10	or	3%	of	293	Tags accounted for (e.g., spit/recovered at dam, recovered by anglers in river)
55	or	19%	of	293	Fish unaccounted for
96	or	42%	of	228	Spawning location determined

Adult yearling-release fish

203	= Number of fish tagged				
158	or	78%	of	203	Entered free-flowing water (Snake River entry = arrival at RM 149)
107	or	68%	of	158	Entered the release river
74	or	47%	of	158	Spawned based on observations at active redd sites

Pittsburg landing

93	= Number of fish tagged				
73	or	78%	of	93	Entered free-flowing water
60	or	82%	of	73	Entered only the Snake River
42	or	58%	of	73	Spawned based on observations at active redd sites
42	or	100%	of	42	Spawned in the Snake River
36	or	86%	of	42	Spawned in the upper half of Snake River (RM197-247)
6	or	14%	of	42	Spawned in the lower half of Snake River (RM147-196)
13	or	18%	of	73	Number of fish that wandered
13	or	100%	of	13	Entered the Snake River and wandered into other rivers
4	or	5%	of	73	Wandered into the Clearwater River
1	or	1%	of	73	Wandered into the Grande Ronde River
9	or	12%	of	73	Wandered into the Salmon River
1	or	1%	of	73	Wandered into more than one tributary

Captain John

34	= Number of fish tagged				
25	or	74%	of	34	Entered free-flowing water
19	or	76%	of	25	Entered only the Snake River
7	or	28%	of	25	Spawned based on observations at active redd sites
6	or	86%	of	7	Spawned in the Snake River
1	or	17%	of	6	Spawned in the upper half of Snake River (RM197-247)
5	or	83%	of	6	Spawned in the lower half of Snake River (RM147-196)
6	or	24%	of	25	Number of fish that wandered
6	or	100%	of	6	Entered the Snake and wandered into other rivers
4	or	16%	of	25	Wandered into the Clearwater River
3	or	12%	of	25	Wandered into the Grande Ronde River
0	or	0%	of	25	Wandered into the Salmon River
1	or	4%	of	25	Wandered into more than one tributary

Big Canyon Creek

76	= Number of fish tagged				
60	or	79%	of	76	Entered free-flowing water
28	or	47%	of	60	Only observed in the Clearwater River
4	or	7%	of	60	Only observed in the Snake River
25	or	42%	of	60	Spawned based on observations at active redd sites
20	or	80%	of	25	Spawned in the Clearwater River
5	or	20%	of	25	Spawned in the Snake River
1	or	20%	of	5	Spawned in the upper half of Snake River (RM197-247)
4	or	80%	of	5	Spawned in the lower half of Snake River (RM147-196)

32	or	53%	of	60	Number of fish that wandered
28	or	47%	of	60	Observed in the Clearwater and other rivers
32	or	53%	of	60	Wandered into the Snake River
1	or	2%	of	60	Wandered into the Grande Ronde River
0	or	0%	of	60	Wandered into the Salmon River
1	or	2%	of	60	Wandered into more than one tributary

Jack yearling-release

45 = Number of fish tagged

Pittsburg landing

16 = Number of fish tagged

11	or	69%	of	16	Entered free-flowing water
10	or	91%	of	11	Entered only the Snake River
0	or	0%	of	11	Wandered into the Clearwater River
1	or	9%	of	11	Wandered into the Grande Ronde River
0	or	0%	of	11	Wandered into the Salmon River
0	or	0%	of	11	Wandered into more than one tributary

Captain John

14 = Number of fish tagged

14	or	100%	of	14	Entered free-flowing water
3	or	21%	of	14	Entered only the Snake River
9	or	64%	of	14	Wandered into the Clearwater River
2	or	14%	of	14	Wandered into the Grande Ronde River
3	or	21%	of	14	Wandered into the Salmon River
2	or	14%	of	14	Wandered into more than one tributary

Big Canyon Creek (Clearwater River)

15 = Number of fish tagged

10	or	67%	of	15	Entered free-flowing water
7	or	70%	of	10	Entered only the Clearwater River
3	or	30%	of	10	Wandered into the Snake River
0	or	0%	of	10	Wandered into the Grande Ronde River
0	or	0%	of	10	Wandered into the Salmon River
0	or	0%	of	10	Wandered into more than one tributary

Adult subyearling-release (pit-tagged) fish

35 = Number of fish tagged

29	or	83%	of	35	Entered free-flowing water (Snake River entry = arrival at RM 149)
23	or	79%	of	29	Entered the release river
16	or	55%	of	29	Spawned based on observations at active redd sites

Pittsburg Landing

17 = Number of fish tagged

16	or	94%	of	17	Entered free-flowing water
14	or	88%	of	16	Entered only the Snake River
10	or	63%	of	16	Spawned based on observations at active redd sites
10	or	100%	of	10	Spawned in the Snake River
9	or	90%	of	10	Spawned in the upper half of the Snake River (RM 197-247)
1	or	10%	of	10	Spawned in the lower half of Snake River (RM147-196)

Billy Creek near Captain John

12 = Number of fish tagged

9	or	75%	of	12	Entered free-flowing water
7	or	78%	of	9	Entered only the Snake River
3	or	33%	of	9	Spawned based on observations at active redd sites

Appendix 2 (continued)

3	or 100%	of	3	Spawned in the Snake River
0	or 0%	of	3	Spawned in the upper half of the Snake River (RM 197-247)
3	or 100%	of	3	Spawned in the lower half of Snake River (RM147-196)

Big Canyon Creek (Clearwater River)

6	= Number of fish tagged			
4	or 67%	of	6	Entered free-flowing water
2	or 50%	of	4	Entered only the Clearwater River
3	or 75%	of	4	Spawned based on observations at active redd sites
3	or 100%	of	3	Spawned in the Clearwater River
0	or 0%	of	3	Spawned in the Snake River

Wild (pit-tagged) fish

10	= Number of fish tagged			
6	or 60%	of	10	Entered free-flowing water
6	or 100%	of	6	Entered only the river where initially captured and pit-tagged as juveniles
6	or 100%	of	6	Spawned based on observations at active redd sites
6	or 100%	of	6	Spawned in river where initially captured and pit-tagged as juveniles

Appendix 3

Redd counts recorded from 1959 to 1978 in the Snake River between Lewiston, Idaho, and the Hells Canyon Dam site.

		Year										
River section	**Citation**	**1959**	**1960**	**-**	**1967**	**-**	**1969**	**-**	**1974**	**1975**	**1976**	**-**	**1978**
				-		-		-				-	
Hells Canyon Dam to Pleasant Valley Dam Site	Irving and Bjornn 1980	19	2	-	144	-	294	-				-	
Pleasant Valley Dam Site to Imnaha River	Irving and Bjornn 1980	7	2	-	11	-	94	-				-	
Imnaha River to Lewiston, ID	Irving and Bjornn 1980	2	0	-	33	-	180	-				-	
		28	**4**	**-**	**188**	**-**	**568**	**-**				**-**	
				-		-		-				-	
Hells Canyon Dam to Johnson Bar	Witty 1988			-		-	170	-	1	N.D.	8	-	
Johnson Bar to Pleasant Valley	Witty 1988			-		-	124	-	10	N.D.	1	-	
Pleasant Valley to Appaloosa	Witty 1988			-		-	61	-	3	N.D.	0	-	
Appaloosa to Mountain Sheep	Witty 1988			-		-	33	-	2	N.D.	4	-	
Mountain Sheep to State Line	Witty 1988			-		-	0	-	0	N.D.	0	-	
				-		**-**	**388**	**-**	**16**	**10**	**13**	**-**	
				-		-		-				-	
Hells Canyon Dam to Asotin, Washington	Groves and Chandler 1996			-		-		-				-	**132**
				-		-		-				-	
				-		-		-				-	
Maximum annual count		**28**	**4**	**-**	**188**	**-**	**568**	**-**	**16**	**10**	**13**	**-**	**132**

Appendix 4

Fall chinook salmon redds counted in the Snake River, 1986-2000, using aerial and underwater search techniques, by river mile (RM), river kilometer (RK), and year.

		Year														
RM	RK	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
148.3	238.6	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
148.5	238.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
148.8	239.4	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
149.1	239.9	-	-	-	1	-	2	-	1	-	-	-	-	2	1	-
151.5	243.8	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
151.9	244.4	-	-	1	-	-	-	-	-	-	3	4	8	-	1	-
152.3	245.2	-	13	15	23	16	-	7	3	5	-	3	12	3	20	21
156.8	252.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
156.9	252.5	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
157.2	252.9	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
157.4	253.3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
157.6	253.6	-	-	-	-	-	-	-	-	-	-	-	1	3	-	-
159.7	257.0	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-
160.8	258.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
161.0	259.0	-	-	-	-	-	-	7	11	-	3	-	7	9	1	7
162.4	261.3	-	-	2	1	2	20	11	1	-	-	2	-	-	1	4
163.0	262.3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
163.3	262.7	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
164.4	264.5	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
164.7	265.0	-	-	-	2	1	-	-	-	1	-	-	1	-	-	-
165.2	265.8	-	-	5	-	-	-	-	2	3	-	-	-	-	-	-
165.3	266.0	-	-	-	-	-	-	-	2	-	-	-	-	1	-	-
165.5	266.3	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
165.7	266.6	-	-	-	-	-	-	-	28	-	-	-	-	-	-	-
165.9	266.9	-	2	14	-	-	1	3	9	-	-	3	-	2	5	-
166.2	267.4	-	-	-	-	-	-	-	17	-	-	-	-	-	-	-
166.6	267.9	-	-	-	-	-	6	-	21	-	-	-	-	6	-	1
168.7	271.4	-	-	-	-	-	-	-	5	6	3	-	-	-	-	-
169.7	272.9	-	-	-	1	-	-	-	-	-	1	1	-	-	-	-
172.5	277.6	-	1	-	-	-	-	-	-	-	-	3	-	4	1	1
173.9	279.8	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1
176.5	284.0	-	-	-	-	-	-	-	-	-	1	-	-	-	-	2
178.3	286.9	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
178.5	287.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
178.9	287.9	-	-	-	1	-	-	-	-	1	-	-	-	2	7	13
179.6	289.0	-	-	-	-	-	-	-	6	13	27	41	5	16	40	56
181.7	292.4	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
183.1	294.6	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
188.2	302.8	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2
190.0	305.7	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
190.1	305.9	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
190.8	307.0	-	1	5	-	2	5	1	-	-	-	1	-	4	2	5
191.7	308.4	2	2	4	-	-	-	-	-	-	-	-	-	-	1	-
193.4	311.2	-	-	-	5	2	-	-	-	2	-	2	1	4	-	-
193.7	311.7	-	4	-	-	-	-	6	1	2	1	-	2	3	-	5
193.8	311.8	-	-	-	-	-	-	-	1	1	1	-	-	-	1	2

Appendix 4 (continued)

Fall chinook salmon redds counted in the Snake River, 1986-2000, using aerial and underwater search techniques, by river mile (RM), river kilometer (RK), and year.

		Year														
RM	RK	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
194.0	312.1	-	2	-	-	3	-	-	1	2	4	2	6	14	11	11
194.1	312.3	-	-	2	-	2	-	-	-	5	-	-	-	-	-	-
196.0	315.4	-	-	3	-	-	-	-	-	2	-	-	-	1	6	10
196.2	315.7	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
198.2	318.9	-	-	-	-	-	-	-	-	-	-	2	-	1	17	14
198.8	319.9	-	5	-	3	2	7	3	-	6	1	6	-	4	15	17
199.4	320.8	-	-	-	-	-	-	-	1	-	-	5	-	-	2	1
201.1	323.6	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
203.1	326.8	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-
204.1	328.4	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
205.3	330.3	-	-	-	-	-	3	-	-	-	1	-	-	3	6	2
205.4	330.5	-	1	-	-	-	-	-	-	-	-	2	-	-	-	4
206.4	332.1	-	1	4	-	-	1	2	1	-	2	-	-	2	4	-
206.6	332.4	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1
207.7	334.2	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
207.8	334.4	-	-	1	-	-	-	-	-	-	-	3	2	-	5	-
207.9	334.5	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
208.0	334.7	-	-	-	1	-	-	-	-	-	2	9	5	13	36	17
208.3	335.2	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-
209.1	336.4	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
209.7	337.4	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-
211.9	340.9	-	-	-	-	-	-	-	2	-	-	-	-	11	10	6
212.2	341.4	-	-	-	-	-	-	-	-	-	2	-	-	17	24	28
212.3	341.6	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3
213.3	343.2	-	-	-	2	-	-	-	-	-	-	1	-	-	-	1
213.5	343.5	-	-	-	-	-	-	-	-	-	-	1	-	-	2	1
213.7	343.8	-	-	-	-	1	-	2	-	-	-	-	-	4	1	1
214.5	345.1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
214.7	345.5	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
215.4	346.6	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-
216.1	347.7	-	-	-	-	-	-	-	-	1	-	-	-	3	1	2
216.9	349.0	-	-	-	-	-	-	-	-	-	-	-	-	-	4	5
217.3	349.6	-	-	-	-	-	-	1	3	-	1	-	-	4	24	6
217.8	350.4	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
218.2	351.1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
218.5	351.6	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3
218.6	351.7	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
218.7	351.9	-	-	-	-	-	-	-	-	-	4	7	-	4	12	5
219.0	352.4	-	-	-	-	-	-	-	-	-	3	2	-	4	5	6
219.3	352.9	-	-	2	-	-	-	1	-	3	-	2	3	6	8	5
222.7	358.3	-	-	-	1	-	-	-	-	-	-	-	-	-	6	-
222.8	358.5	2	3	-	-	-	-	-	-	-	-	-	-	-	-	5
222.9	358.6	-		-	3	-	-	-	3	1	-	-	-	-	9	-
223.2	359.1	-	-	-	-	-	-	-	-	3	3	-	-	-	3	-
223.7	359.9	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-

Appendix 4 (continued)

Fall chinook salmon redds counted in the Snake River, 1986-2000, using aerial and underwater search techniques, by river mile (RM), river kilometer (RK), and year.

		Year														
RM	RK	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
224.7	361.5	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-
225.0	362.0	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
225.1	362.2	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
226.7	364.8	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
228.0	366.9	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
235.1	378.3	-	-	-	-	-	-	-	-	-	1	-	-	1	2	3
235.7	379.2	-	4	-	3	-	-	-	-	5	2	7	1	4	11	16
236.0	379.7	1	1	2	1	-	-	-	-	-	-	-	-	-	2	1
236.1	379.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
236.7	380.9	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
237.0	381.3	-	-	-	-	-	-	-	5	3	1	-	2	8	6	13
238.3	383.4	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
238.6	383.9	-	2	-	2	-	-	-	-	-	1	-	-	-	4	4
240.5	387.0	-	6	-	-	-	-	-	-	-	-	1	-	2	8	1
240.7	387.3	-	-	-	3	-	6	-	-	-	-	1	1	4	7	11
241.0	387.8	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
242.8	390.7	-	-	-	-	-	-	-	-	-	-	-	-	1	-	4
243.0	391.0	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
243.3	391.5	-	1	-	1	-	-	-	-	-	-	-	-	-	-	4
243.5	391.8	-	-	-	-	-	-	-	-	-	-	2	-	1	-	-
244.0	392.6	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
244.6	393.6	-	-	-	1	2	-	-	-	-	-	-	-	-	1	2
245.3	394.7	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
245.7	395.3	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
245.8	395.5	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
246.5	396.6	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
		7	66	64	58	37	51	47	127	67	71	113	58	185	373	346